C/015/0032 Incoming
#3724

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GENWAL™
RESOURCES, INC.

P.O. Box 910, East Carbon, Utah 84520 794 North "C" Canyon Rd, East Carbon, Utah 84520
Telephone (435) 888-4000 Fax (435) 888-4002

Dana Dean, P.E.
Associate Director
Utah Division of Oil, Gas and Mining
P.O. Box 145801
1594 West North Temple, Suite 1210
Salt Lake City, Utah 84114-5801

December 30, 2010

Re: Crandall Canyon Mines, C/015/032
Division Order 10A
Response to Division Letter of December 21, 2010
Bullet Items 1, 2 and 3

Dear Ms. Dean:

This letter is written in response to your letter to Denise Dragoo, dated December 21, 2010, regarding the schedule for the company's response to the Division's letter of December 7, 2010, involving submission of information for Division Order 10A, specifically Task #3703 related to changes to MRP Appendix 7-65. Your letter of December 21, 2010, contained five bullet items to be addressed by January 6, 2011. For accounting purposes, I have numbered these as bullet items 1 through 5. This letter addresses bullet items 1, 2 and 3, as pertains to Task #3703. Please note that this letter does not address the issues of Task #3704, which involves changes to Appendix 7-15 (PHC), which will be addressed directly by Erik Petersen through Denise Dragoo, Esq., and correspond to bullet items 4 and 5 of your December 21, 2010 letter.

As a point of clarification, your letter of December 21, 2010 refers to the Division's letter of December 7, 2010, citing deficiencies in the response to the Division's letter of July 2010, and stating that the response to this letter was "grossly inadequate". According to my records, the company addressed the December 7, 2010 letter in a hand-delivered submittal to your office on December 14, 2010, entitled "Response to Division Order DO10A, Revised Stipulation November 4, 2010, Additional Information Requests to Address Task #3582, Bullet Items 1, 3 and 4, Submitted December 14, 2010". In light of the "grossly inadequate" comment in your December 21, 2010 letter, it is not apparent whether or not the Division had received and reviewed the December 14, 2010 submittal prior to sending out the December 21 letter, since this latest submittal was made as a good-faith effort to respond to the Division's request in a professional manner. However, in checking my emails from Susan Steab, I received no confirmation of the Division's receipt of the submittal, although I did receive confirmation of several other submittals which I had made at the same time. I am hoping the submittal has now worked its way through the system. In the event that the December 14, 2010 submittal has been inadvertently misplaced, I am sending you another copy with this current submittal, as backup.

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Continuing with the response to your December 21, 2010 letter..........

Bullet Item 1.....*Provide capital, operating, and maintenance costs for the current treatment system.*

Response: Detailed costs were provided in the November 30 submittal (entitled "Change to Appendix 7-65, Division Order DO10A, Paragraph IV, Item 1, Revised Stipulation November 4, 2010"). These costs totaled $579,905.89. This was compiled from an extensive list of company requisitions and invoices, and represents the most accurate account obtainable of the costs incurred by the company in constructing and operating the existing water treatment facility. In this current submittal, we have taken the same list and attempted to break it down into the requested categories of Capital, Operating and Maintenance costs. In reviewing these costs, please keep the following points in mind:

1) Much of these costs have essentially been Research and Development (R & D) costs. As has been explained in previous correspondence with the Division, construction and operation of this facility has been on what could be described as a "trial and error" basis, and also under emergency duress conditions in order to come into compliance with discharge violation requirements. This is the first facility of its kind constructed in the Utah coal fields, involving unique water chemistry. Treatment options previously developed for eastern coal mine operations could not be directly replicated at the Crandall mine. It is estimated that at least half of the capital costs could be attributed to R & D.

2) Most of the on-site work was completed by Scamp Excavation, a local contractor. Oftentimes, Scamp was simultaneously involved in various aspects of building parts of the facility, maintaining the chemical supply, and cleaning the sludge from the settling basin. Since these activities were billed with lump invoices, it is impossible to account for the exact breakdown of capital, operating and maintenance costs, especially where Scamp also purchased many of the construction supplies and parts directly. Therefore, we have broken down the Scamp costs as 85% capital, 10% operating and 5% maintenance, based on our best assessment. The same percentages have been applied to the miscellaneous items. The Nalco chemicals (coagulant and flocculant) have been assigned to operating costs, and most other vendor equipment items previously listed have been placed under capital cost. Maintenance costs are primarily attributed to Scamp, associated with snow removal, etc., although this could also be considered as operating cost. Maintenance costs are often ascribed as a component of operating costs, with no definite distinction between the two. As explained earlier, breaking the costs down into the three separate categories can be somewhat of an arbitrary judgement call. The capital costs are further broken down to reflect the R & D nature of the project to date.

3) These costs are subject to change in the near future. We are still making improvements to the mechanical plant, including more efficient piping and bulk material

handling. We are also in the process of upgrading the electrical controls and monitoring system for increased reliability. And work continues on improving the sludge cleaning process. We are also considering test trials of other treatment chemicals, in particular, to eliminate or reduce the amount of aluminum chloride. All of these changes and improvements are complicated by the fact that we must constantly stay in compliance with UPDES discharge parameters on a 24/365 basis, while at the same time trying to convert to upgraded facilities and conduct new testing trials without being able to shut the existing facility down for more than a few minutes at a time. In short, the facility has been and still is a work in progress. Once the improvements have been completed, all costs will certainly drop lower and stabilize. It should be pointed out however, that the facility, even in its evolving and current form, has been able to keep the discharge water in compliance with all state and federal requirements for the past ten months since March, 2010.

4) As stated in previous correspondence with the Division, these past costs associated with the current treatment facility cannot be construed as representative of any future treatment costs, especially given the emergency, "trial-and-error", R and D nature of the development of the facility to date, and given the uncertainty of the necessity of long-term water treatment requirements in the future. For the same reasons these historic costs are not considered representative of even the short-term operational costs. Only after the facility is in its final operating configuration and with much more operating experience under our belts can any cost information be deemed meaningful.

<u>Bullet Item 2</u>.....*Update Appendix 7-65*

<u>Response:</u> Appendix 7-65 has been updated in the November 30, 2010 submittal, and also again in the December 14, 2010 submittal as referenced above. Additional clarification to Appendix 7-65 has been subsequently supplied to the Division in a second submittal of December 14, 2010, entitled "Response to Division Order DO10A, Task # 3703, Bullet Items 3 and 5", which makes reference to still another submittal (also made on December 14) for a change to the Centennial (Tower) MRP entitled "Utilization of Sediment Pond A for Storage of Crandall Mine Iron Sludge Material". As the title implies, that submittal addresses the option for storing the iron sludge at the Tower mine rather than at the Wildcat Loadout. In addition, included in this present submittal is an As-Built Mine Water Treatment Flow Diagram which is to be added at this time to Appendix 7-65 as additional information.

<u>Bullet Item 3</u>.....*Identify specific treatment chemicals and their application rates.*

Response: The chemicals used for treatment are a coagulant injected ahead of the oxidizer unit and a flocculant injected after the oxidizer unit. These chemicals were described in the December 14, 2010 submittal, along with complete MSDS sheets for each. To re-cap, the coagulant is a Nalco brand Ultrion 8187 polyaluminum chloride. The Flocculant is a Nalco brand Nalclear 7763 polyacrylamide. The dosage rate for the coagulant is currently about 38

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ppm. The dosage rate for the floculant is estimated at about 5 ppm. We will soon be installing a fresh-water make-up supply and an automated variable rate flow-control pump which should allow the dosage rate of both the coagulant and flocculant to be more closely regulated and reduced. It should be noted that the residual aluminum in the outflow is consistently below state/federal water quality limits for cold water fisheries, as Crandall Creek is designated. We hope in the near future to conduct test trials on alternatives to this aluminum-based coagulant. Also, we have recently implemented a laboratory procedure for testing the residual polymer (floc) in the discharge water. Test results to date have shown the polymer at non-detect levels (less than 0.1 ppm). This is important because the NSF 60 limit for drinking water treatment. plants for Nalco 8187 is 1 ppm, and the Huntington Creek drainage is classified as a municipal watershed. These chemicals and dosage rates are reflected on the As-Built Flow diagram referenced above.

In summary, enclosed with this response submittal are the following:

1) Amended (categorized) capital, operating and maintenance costs.

2) Six (6 each) copies of the As-Built Flow Diagram for inclusion in Appendix 7-65 of the MRP.

3) An extra copy of the complete December 14, 2010 (previous) submittal.

If you have any questions or comments regarding this response please contact me at 435 888-4017.

Sincerely,

David Shaver
Resident Agent

cc: Denise Dragoo, Esq.

Form DOGM - C1 (Last Revised December 30, 2010)

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File Folder # 3

APPLICATION FOR PERMIT PROCESSING

Permit Change ☐	New Permit ☐	Renewal ☐	Transfer ☐	Exploration ☐	Bond Release ☐	Permit Number: 015/032

Title of Proposal: Response to Division Order DO10A, Letter of Dec. 21, 2010 Bullet items 1,2 and 3

Mine: Crandall Canyon Mines

Permittee: **GENWAL Resources, Inc.**

Description, include reason for application and timing required to implement:.

Instructions: *If you answer yes to any of the first 8 questions (gray), submit the application to the Salt Lake Office. Otherwise, you may submit it to your reclamation specialist.*

☐ Yes	☑ No	1. Change in the size of the Permit Area? ________ acres Disturbed Area? _____ acres ☐ increase ☐ decrease.
☑ Yes	☐ No	2. Is the application submitted as a result of a Division Order?
☐ Yes	☑ No	3. Does application include operations outside a previously identified Cumulative Hydrologic Impact Area?
☐ Yes	☑ No	4. Does application include operations in hydrologic basins other than as currently approved?
☐ Yes	☑ No	5. Does application result from cancellation, reduction or increase of insurance or reclamation bond?
☐ Yes	☑ No	6. Does the application require or include public notice/publication?
☐ Yes	☑ No	7. Does the application require or include ownership, control, right-of-entry, or compliance information?
☐ Yes	☑ No	8. Is proposed activity within 100 feet of a public road or cemetery or 300 feet of an occupied dwelling?
☐ Yes	☑ No	9. Is the application submitted as a result of a Violation?
☐ Yes	☑ No	10. Is the application submitted as a result of other laws or regulations or policies? Explain:
☐ Yes	☑ No	11. Does the application affect the surface landowner or change the post mining land use?
☐ Yes	☑ No	12. Does the application require or include underground design or mine sequence and timing?
☐ Yes	☑ No	13. Does the application require or include collection and reporting of any baseline information?
☐ Yes	☑ No	14. Could the application have any effect on wildlife or vegetation outside the current disturbed area?
☐ Yes	☑ No	15. Does application require or include soil removal, storage or placement?
☐ Yes	☑ No	16. Does the application require or include vegetation monitoring, removal or revegetation activities?
☐ Yes	☑ No	17. Does the application require or include construction, modification, or removal of surface facilities?
☐ Yes	☑ No	18. Does the application require or include water monitoring, sediment or drainage control measures?
☐ Yes	☑ No	19. Does the application require or include certified designs, maps, or calculations?
☐ Yes	☑ No	20. Does the application require or include subsidence control or monitoring?
☐ Yes	☑ No	21. Have reclamation costs for bonding been provided for?
☐ Yes	☑ No	22. Does application involve a perennial stream, a stream buffer zone or discharges to a stream?
☐ Yes	☑ No	23. Does the application affect permits issued by other agencies or permits issued to other entities?

☐ **Attach _3_ complete copies of the application.**

I hereby certify that I am a responsible official of the applicant and that the information contained in this application is true and correct to the best of my information and belief in all respects with the laws of Utah in reference to commitments, undertakings, and obligations, herein. (R645-301-123)

[signature] Agent 12/30/2010

Signed - Name - Position - Date

Subscribed and sworn to before me this 30TH day of December 2010

Linda Kerns

Notary Public

My Commission Expires: March 27, 2013

Attest: STATE OF Utah

COUNTY OF Carbon

Notary Public
LINDA KERNS
Commission #578211
My Commission Expires
March 27, 2013
State of Utah

Received by Oil, Gas & Mining

ASSIGNED TRACKING NUMBER

Application for Permit Processing
Detailed Schedule of Changes to the MRP

COPY

Title of Application: Response to Division Order DO10A, letter of Dec. 21,2010 Bullet items 1, 2 and 3	Permit Number: 015/032 Mine: CRANDALL CANYON MINES Permittee: GENWAL RESOURCES

Provide a detailed listing of all changes to the mining and reclamation plan which will be required as a result of this proposed permit application. Individually list all maps and drawings which are to be added, replaced, or removed from the plan. Include changes of the table of contents, section of the plan, pages, or other information as needed to specifically locate, identify and revise the existing mining and reclamation plan. Include page, section and drawing numbers as part of the description.

			DESCRIPTION OF MAP, TEXT, OR MATERIALS TO BE CHANGED
☐ ADD	☐ REPLACE	☐ REMOVE	
☐ ADD	☐ REPLACE	☐ REMOVE	
☒ ADD	☐ REPLACE	☐ REMOVE	Mine-Water Treatment As-Built
☐ ADD	☐ REPLACE	☐ REMOVE	Flow Diagram to be added
☐ ADD	☐ REPLACE	☐ REMOVE	behind other drawings in
☐ ADD	☐ REPLACE	☐ REMOVE	Attachment 8 of Appendix 7-65
☐ ADD	☐ REPLACE	☐ REMOVE	(Chapter 7)
☐ ADD	☐ REPLACE	☐ REMOVE	
☐ ADD	☐ REPLACE	☐ REMOVE	
☐ ADD	☐ REPLACE	☐ REMOVE	
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☐ ADD	☐ REPLACE	☐ REMOVE	
☐ ADD	☐ REPLACE	☐ REMOVE	

Any other specific or special instructions required for insertion of this proposal into the Mining and Reclamation Plan?

Crandall Canyon Mine
Costs for Construction and Operation

Year:	Research & Development	Capital	Operating		Maintenance
	1/2 of Horizon Lab Costs				
2009	$55,108.24	$55,108.24	$9,677.98	$12,431.35	$6,215.68
2010	$127,874.43	$127,874.43	$10,699.04	$162,892.49	$12,024.02
	$182,982.67	$182,982.67	$20,377.02	$175,323.84	$18,239.70
Total					$579,905.89

NOTE: ALL COSTS ARE HISTORIC AND CANNOT BE USED FOR FUTURE ESTIMATES

Crandall Canyon Mine - Iron Treatment Facility
2009 Costs for Construction and Operation

Requisition #		Nalco	Scamp	Bookcliff	WaterSolve	Badlands	CC Hydraulics	Chute Supply	Misc.
DS	359							2,500.00	
DS	360								18,000.00
DS	424							1,800.00	
DS	429								1,650.00
DS	430					250.00			
DS	433								300.00
		0.00	104,363.50	0.00	0.00	250.00	0.00	4,300.00	19,950.00
Total									128,863.50

NOTE: ALL COSTS ARE HISTORIC AND CANNOT BE USED FOR FUTURE ESTIMATES

Crandall Canyon Mine											
2009											
Capital							Operating			Maintenance	
Bookcliff	WaterSolve	Badlands	CC Hydraulics	Chute Supply	Scamp 85% of Total	Misc. 85% of Total	Nalco	Scamp 10% of Total	Misc. 10% of Total	Scamp 5% of Total	Misc. 5% of Total
				2,500.00							
						18,000.00			18,000.00		18,000.00
				1,800.00							
						1,650.00			1,650.00		1,650.00
		250.00									
						300.00			300.00		300.00
0.00	0.00	250.00	0.00	4,300.00	104,363.50	19,950.00	0.00	104,363.50	19,950.00	104,363.50	19,950.00
0.00	0.00	250.00	0.00	4,300.00	88,708.98	16,957.50	0.00	10,436.35	1,995.00	5,218.18	997.50
Total						110,216.48			12,431.35		6,215.68

NOTE: ALL COSTS ARE HISTORIC AND CANNOT BE USED FOR FUTURE ESTIMATES

Crandall Canyon Mine - Iron Treatment Facility
2010 Costs for Construction and Operation

Requisition #	Nalco	Scamp	Bookcliff	WaterSolve	Badlands	CC Hydraulics	Chute Supply	Misc.
DM-008	10,000.00							
DM-010	6,000.00							
DM-025								101.88
DM-026	22,018.32							
DM-046	22,018.32							
DS-509	15,800.00							
DM-053	3,500.00							
DM-054			5,200.00					
DM-055			1,300.00					
DM-057			1,300.00					
DM-060			500.00					
DM-062				12,000.00				
DM-064			1,810.00					
DM-066					2,300.00			
DM-067	23,000.00							
DM-068	3,500.00							
DM-072						100.00		
DM-075			1,810.00					
SD-876			1,200.00					
SD-875			3,600.00					
DM-078	275.00							
449	2,800.00							
450	1,000.00							
452								4,890.00
454								300.00
455								1,600.00
456								5,000.00
458								1,750.00
459	1,000.00							
462								260.00
463	6,700.00							
464								6,700.00
465	20,000.00							
468						252.00		
469								550.00
472						225.00		

Crandall Canyon Mine - Iron Treatment Facility
2010 Costs for Construction and Operation

Requisition #	Nalco	Scamp	Bookcliff	WaterSolve	Badlands	CC Hydraulics	Chute Supply	Misc.
473						20.00		
474								820.00
475								706.70
480						713.04		
481						87.40		
484						2,596.00		
486						2,485.00		
487								150.00
488						4,581.07		
489								279.52
492						3,228.68		
497						254.28		
499	1,232.80							

Crandall Canyon Mine - Iron Treatment Facility
2010 Costs for Construction and Operation

Requisition #	Nalco	Scamp	Bookcliff	WaterSolve	Badlands	CC Hydraulics	Chute Supply	Misc.
510								590.00
511					5,054.00			
515								6,400.00
525								4,120.00
535						724.00		
	138,844.44	206,262.36	16,720.00	12,000.00	7,354.00	15,266.47	0.00	34,218.10
Total								430,665.37

NOTE: ALL COSTS ARE HISTORIC AND CANNOT BE USED FOR FUTURE ESTIMATES

Crandall Canyon Mine

2010

Capital							Operating			Maintenance	
Bookcliff	WaterSolve	Badlands	CC Hydraulics	Chute Supply	Scamp 85% of Total	Misc. 85% of Total	Nalco	Scamp 10% of Total	Misc. 10% of Total	Scamp 5% of Total	Misc. 5% of Total
							10,000.00				
							6,000.00				
						101.88			101.88		101.88
							22,018.32				
							22,018.32				
							15,800.00				
							3,500.00				
5,200.00											
1,300.00											
1,300.00											
500.00											
	12,000.00										
1,810.00											
		2,300.00									
							23,000.00				
							3,500.00				
			100.00								
1,810.00											
1,200.00											
3,600.00											
							275.00				
							2,800.00				
							1,000.00				
						4,890.00			4,890.00		4,890.00
						300.00			300.00		300.00
						1,600.00			1,600.00		1,600.00
						5,000.00			5,000.00		5,000.00
						1,750.00			1,750.00		1,750.00
							1,000.00				

							260.00			260.00		260.00
Crandall Canyon Mine												
2010 - Continued												
	Capital							Operating			Maintenance	
								6,700.00				
							6,700.00			6,700.00		6,700.00
								20,000.00				
				252.00								
							550.00			550.00		550.00
				225.00								
				20.00								
							820.00			820.00		820.00
							706.70			706.70		706.70
				713.04								
				87.40								
				2,596.00								
				2,485.00								
							150.00			150.00		150.00
				4,581.07								
							279.52			279.52		279.52
				3,228.68								
				254.28								
								1,232.80				
							590.00			590.00		590.00
			5,054.00									
							6,400.00			6,400.00		6,400.00
							4,120.00			4,120.00		4,120.00
				724.00								
	16,720.00	12,000.00	7,354.00	15,266.47	0.00	206,262.36	34,218.10	138,844.44	206,262.36	34,218.10	206,262.36	34,218.10
	16,720.00	12,000.00	7,354.00	15,266.47	0.00	175,323.01	29,085.39	138,844.44	20,626.24	3,421.81	10,313.12	1,710.91
Total							255,748.86			162,892.49		12,024.02

NOTE: ALL COSTS ARE HISTORIC AND CANNOT BE USED FOR FUTURE ESTIMATES

Crandall Canyon Mine - Iron Treatment Facility Horizon Lab Costs		
Date:	**Amount**	**Description**
02/04/09	150.00	Water Analysis
03/11/09	1,846.60	Water Analysis
03/26/09	4,478.70	Water Analysis
06/11/09	249.75	Water Analysis
07/15/09	328.50	Water Analysis
09/02/09	1,862.65	Water Analysis
09/10/09	4,185.65	Water Analysis
09/23/09	328.50	Water Analysis
10/14/09	1,160.60	Water Analysis
10/28/09	164.25	Water Analysis
11/11/09	4,600.75	Water Analysis
	19,355.95	
1/2# 2009	**9,677.98**	
03/24/10	5,231.85	Water Analysis
05/13/10	177.00	Water Analysis
05/27/10	4,715.80	Water Analysis
06/09/10	355.80	Water Analysis
07/08/10	1,239.65	Water Analysis
	21,398.08	
1/2# 2010	**10,699.04**	

NOTE; ALL COSTS ARE HISTORIC AND CANNOT BE USED FOR FUTURE ESTIMATES

Crandall Canyon Mine - Iron Treatment Facility
Scamp Costs for Construction and Operation

Date:	Amount	Invoice	Description
04/15/09	5,000.00	2246	Locate Discharge Pipe
04/30/09	10,000.00	2267	Drainage/Culvert
04/30/09	5,000.00	2268	Iron Treatment Facility
04/30/09	5,100.00	2269	Flow Meter
05/12/09	5,000.00	2282	Pump System for Decanting Sed Pond
05/28/09	4,500.00	2295	French Drain
05/28/09	5,797.50	2296	Portal Drain
06/24/09	4,800.00	2317	Anchor Pipe
08/06/09	4,630.00	2333	French Drain/Violation
08/06/09	4,880.00	2334	Sediment Pond Maintenance
08/06/09	4,880.00	2335	Anchor Pipe
08/06/09	4,876.00	2336	Install Valve Assembly
08/06/09	4,890.00	2337	Install Under-Drain
09/18/09	4,300.00	2352	Install Seep Collection System
09/21/09	1,000.00	2353	Install Flow Meter
09/21/09	1,000.00	2354	Materials for Flow Meter
11/11/09	23,950.00	2378	Dirt Work for Oxidizer
11/11/09	4,760.00	2379	Gravel Basin Berm
	104,363.50		
01/29/10	2,812.45	2439	Gravel-Basin Berm
02/03/10	6,053.21	2440	Portal Drainage
02/03/10	5,000.00	2442	Pit liner/Iron Sediment Pond
02/04/10	3,500.00	2443	Pit liner/Iron Sediment Pond
03/09/10	3,500.00	2477	Re-pipe/Add Curtain
03/09/10	4,789.00	2478	Install Valbes/Chemical Treatment
03/09/10	4,722.00	2479	Install Injection System
03/09/10	3,500.00	2480	Install NaOH Injection system
04/01/10	3,500.00	2499	Install NaOH Injection system
04/12/10	5,000.00	2505	Ops Assist Iron Treatment Facility
04/15/10	4,772.00	2515	Install Sludge Clean Out Tubes
04/28/10	10,640.00	2523	Maintenance Iron Treatment Facility
05/25/10	6,750.00	2540	Pond cleaning
05/28/10	6,950.00	2543	Iron Treatment Facility
05/28/10	6,842.00	2545	Sludge re-circulation
06/03/10	7,000.00	2546	Iron Treatment Facility
06/03/10	7,000.00	2547	Additional Iron Treatment Pond Work
06/18/10	4,817.00	2563	Ops Assist Iron Treatment Facility
07/07/10	6,980.00	2576	Oil Shed Iron Treatment Facility
07/19/10	5,420.00	2582	Iron Treatment Facility and Pond Cleaning
07/19/10	5,400.00	2583	Ops Assist Iron Treatment Facility
07/28/10	3,825.00	2606	Oil Shed Iron Treatment Facility
08/23/10	9,500.00	2623	Ops Assist Iron Treatment Facility
08/23/10	9,500.00	2624	Iron Treatment Cleaning August 2010
09/02/10	19,429.06	2633	Maintenance/Monitor Chemical Treatment
09/02/10	10,879.68	2634	Ops Assist Iron Treatment Facility
10/12/10	10,226.36	2667	Temp Chemical Injection Shed Enclosed
10/28/10	5,450.00	2705	Temp Chemical Injection Shed Enclosed
11/02/10	9,500.00	2706	Iron Treatment Pond Cleaning

11/05/10	13,004.60	2719	Monitor Ponds/Haul Water
	206,262.36		

NOTE: ALL COSTS ARE HISTORIC AND CANNOT BE USED FOR FUTURE ESTIMATES

Crandall Canyon Mine

2009-2010 Costs for Construction and Operation

Year:	1/2 of Horizon Lab Cost	Total Cost:
2009	9,677.98	$128,863.50
2010	10,699.04	$430,665.37
	20,377.02	559,528.87
Total		**$579,905.89**

NOTE: ALL COSTS ARE HISTORIC AND CANNOT BE USED FOR FUTURE ESTIMATES

C/015/032 Incoming

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L.L.P.
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DENVER
LAS VEGAS
ORANGE COUNTY
PHOENIX
SALT LAKE CITY
TUCSON

Denise A. Dragoo, Esq.
(801) 257-1998
ddragoo@swlaw.com

January 6, 2011
HAND DELIVERED

RECEIVED
JAN 06 2011
DIV. OF OIL, GAS & MINING

Ms. Dana Dean, P.E.
Associate Director
Utah Division of Oil, Gas and Mining
1594 West North Temple
Salt Lake City, Utah 84116

RE: Crandall Canyon Mine, C/015/032; Division Order 10A; Response to Division Letter of December 21, 2010

Dear Ms. Dean:

On behalf of Genwal Resources, Inc., enclosed is the response to your letter dated December 21, 2010, requesting additional information to address Division Order 10A (Task ID #3703) and Paragraph IV, Item 2 (Task ID #3704). David Shaver has responded to Task ID #3703 in the enclosed cover letter and attachments dated December 30, 2010, related to amendment of MRP Appendix 7-65. Also enclosed is a copy of Genwal's December 14, 2010 response to Division Order 10A (Task #3582), which also addressed MRP Appendix 7-65. It was not clear from your letter whether the Division had received this submittal as of December 21, 2010. Finally, enclosed are revisions to the PHC, Appendix 7-15, which addresses Task ID #3704. This submission includes 6 copies of the redline, strikeout revisions to the text of the PHC, 5 pdf files with Figures PHC 1-1 through PHC 5 and a pdf of PHC Attachment 1. The series of graphs included as PHC Attachment 1 provide an analysis of the water monitoring data through the third quarter of 2010 and supports the conclusion set forth in the revised PHC.

Also, by letter dated December 21, 2010, Assistant Attorney General Steve Alder, referenced the Division's prehearing briefs as providing the legal authority under Division Order 10 for requiring the type and amount of chemicals and other details regarding the treatment of Crandall Canyon Mine discharge waters. Genwal has disputed those provisions of Division Order 10 which purport to require the operator to post a bond for the perpetual treatment of mine water discharge. *In the Matter of the Petition of Genwal Resources, Inc. for Review of Division Order 10A,* Crandall Canyon Mine, Board Docket No. 2010-026, Cause No. C/015/0002. By submitting this response, Genwal does not waive its objection to the Division's use of this information to estimate the amount of the protested bond. Genwal incorporates by reference its

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petition and pre-trial briefs in the above-entitled matter. Genwal's operational facilities are treating mine water discharge to meet water quality standards. Genwal is in compliance and the Division has failed to specifically articulate the regulation requiring Genwal to provide the level of detail set forth in Division Order 10 regarding the type and amount of chemicals used to successfully treat the mine water discharge.

Please let me know if you have further questions regarding this response.

Very truly yours,

Denise A. Dragoo

DD:jmc
Enclosures
cc: David Shaver
David Hibbs
Kevin Anderson, Esq.
Mike McKown, Esq.
Steve Alder, Esq.
Farley Wood

APPLICATION FOR COAL PERMIT PROCESSING

Permit Change ☒ New Permit ☐ Renewal ☐ Exploration ☐ Bond Release ☐ Transfer ☐

Permittee: Genwal Resources, Inc.
Mine: Crandall Canyon Mine **Permit Number:** 015/032
Title: Response to Division Order DO-10-A, Paragraph IV, Item 2
Description, Include reason for application and timing required to implement:

Instructions: If you answer yes to any of the first eight questions, this application may require Public Notice publication.

☐ Yes ☒ No 1. Change in the size of the Permit Area? Acres: ________ Disturbed Area: ________ ☐ increase ☐ decrease.
☒ Yes ☐ No 2. Is the application submitted as a result of a Division Order? DO# 10-A
☐ Yes ☒ No 3. Does the application include operations outside a previously identified Cumulative Hydrologic Impact Area?
☐ Yes ☒ No 4. Does the application include operations in hydrologic basins other than as currently approved?
☐ Yes ☒ No 5. Does the application result from cancellation, reduction or increase of insurance or reclamation bond?
☐ Yes ☒ No 6. Does the application require or include public notice publication?
☐ Yes ☒ No 7. Does the application require or include ownership, control, right-of-entry, or compliance information?
☐ Yes ☒ No 8. Is proposed activity within 100 feet of a public road or cemetery or 300 feet of an occupied dwelling?
☐ Yes ☒ No 9. Is the application submitted as a result of a Violation? NOV # ________
☐ Yes ☒ No 10. Is the application submitted as a result of other laws or regulations or policies?
Explain: ________
☐ Yes ☒ No 11. Does the application affect the surface landowner or change the post mining land use?
☐ Yes ☒ No 12. Does the application require or include underground design or mine sequence and timing? (Modification of R2P2)
☐ Yes ☒ No 13. Does the application require or include collection and reporting of any baseline information?
☐ Yes ☒ No 14. Could the application have any effect on wildlife or vegetation outside the current disturbed area?
☐ Yes ☒ No 15. Does the application require or include soil removal, storage or placement?
☐ Yes ☒ No 16. Does the application require or include vegetation monitoring, removal or revegetation activities?
☐ Yes ☒ No 17. Does the application require or include construction, modification, or removal of surface facilities?
☐ Yes ☒ No 18. Does the application require or include water monitoring, sediment or drainage control measures?
☐ Yes ☒ No 19. Does the application require or include certified designs, maps or calculation?
☐ Yes ☒ No 20. Does the application require or include subsidence control or monitoring?
☐ Yes ☒ No 21. Have reclamation costs for bonding been provided?
☐ Yes ☒ No 22. Does the application involve a perennial stream, a stream buffer zone or discharges to a stream?
☐ Yes ☒ No 23. Does the application affect permits issued by other agencies or permits issued to other entities?
☐ Yes ☒ No 24. Does the application include confidential information and is it clearly marked and separated in the plan?

Please attach three (3) review copies of the application. If the mine is on or adjacent to Forest Service land please submit four (4) copies, thank you. (These numbers include a copy for the Price Field Office)

I hereby certify that I am a responsible official of the applicant and that the information contained in this application is true and correct to the best of my information and belief in all respects with the laws of Utah in reference to commitments, undertakings, and obligations, herein.

DAVID W. Hibbs	President	1/6/11	David W. Hibbs
Print Name	Position	Date	Signature (Right-click above choose certify then have notary sign below)

Subscribed and sworn to before me this 6TH day of January, 2011

Notary Public: Linda Kerns, state of Utah.

My commission Expires: March 27, 2013
Commission Number: 578211 } ss:
Address: 345 North 700 East
City: Price, State: ut Zip: 84501

Notary Public
LINDA KERNS
Commission #578211
My Commission Expires
March 27, 2013
State of Utah

For Office Use Only:	Assigned Tracking Number:	Received by Oil, Gas & Mining
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Form DOGM- C1 (Revised December 10, 2007)

APPLICATION FOR COAL PERMIT PROCESSING
Detailed Schedule Of Changes to the Mining And Reclamation Plan

Permittee: Genwal Resources, Inc.
Mine: Crandall Canyon Mine
Permit Number: 015/032
Title: Response to Division Order DO-10-A, Paragraph IV, Item 2

Provide a detailed listing of all changes to the Mining and Reclamation Plan, which is required as a result of this proposed permit application. Individually list all maps and drawings that are added, replaced, or removed from the plan. Include changes to the table of contents, section of the plan, or other information as needed to specifically locate, identify and revise the existing Mining and Reclamation Plan. Include page, section and drawing number as part of the description.

			DESCRIPTION OF MAP, TEXT, OR MATERIAL TO BE CHANGED
☐ Add	☒ Replace	☐ Remove	Chapter 7, Appendix 7-15, Probable Hydrologic Consequences Determination
☐ Add	☐ Replace	☐ Remove	
☐ Add	☐ Replace	☐ Remove	
☐ Add	☐ Replace	☐ Remove	
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☐ Add	☐ Replace	☐ Remove	

Any other specific or special instruction required for insertion of this proposal into the Mining and Reclamation Plan.	Received by Oil, Gas & Mining
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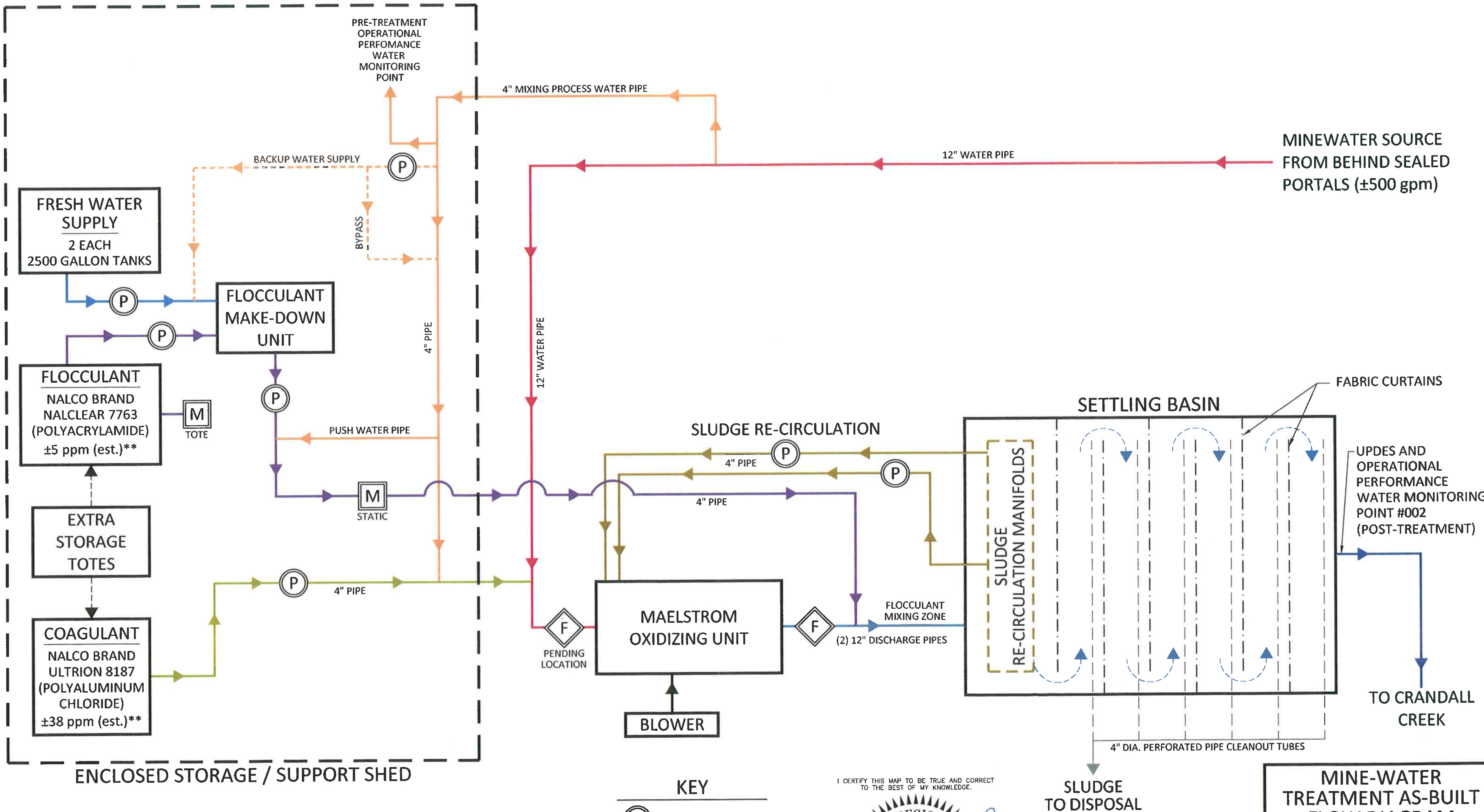
Form DOGM - C2 (Revised December 10, 2007)

NOTE TO REVIEWERS:

ADD THIS FLOW DIAGRAM DRAWING BEHIND
THE OTHER DRAWINGS IN
ATTACHMENT 8
APPENDIX 7-65



KEY

- (P) PUMP
- (F) FLOW METER
- [M] MIXER

** THESE CHEMICALS ARE CURRENT AS OF DECEMBER 2010. DOSAGE RATES ARE APPROXIMATE. CHEMICALS AND RATES MAY CHANGE IN THE FUTURE BASED UPON TRIAL TESTING RESULTS, AND IMPROVED MECHANIZATION AND CONTROL.

I CERTIFY THIS MAP TO BE TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE.

UTAH REGISTERED PROFESSIONAL ENGINEER #6449561 David W. Hibbs 12/29/10

MINE-WATER TREATMENT AS-BUILT FLOW DIAGRAM

Crandall Canyon Mines
Crandall Canyon
P.O. BOX 910
EAST CARBON, UTAH

DRAWN BY	PJ	SCALE	NONE
APPROVED BY	DS	DATE	29 DECEMBER 2010
SHEET			

G:\Current Drawings\...Maps\Crandall Canyon\Crandall Canyon\Current\CranDall Portal Reclamation\Settlement Pond Flow Diagram.dwg, Model, 12...10 3:25:37 PM

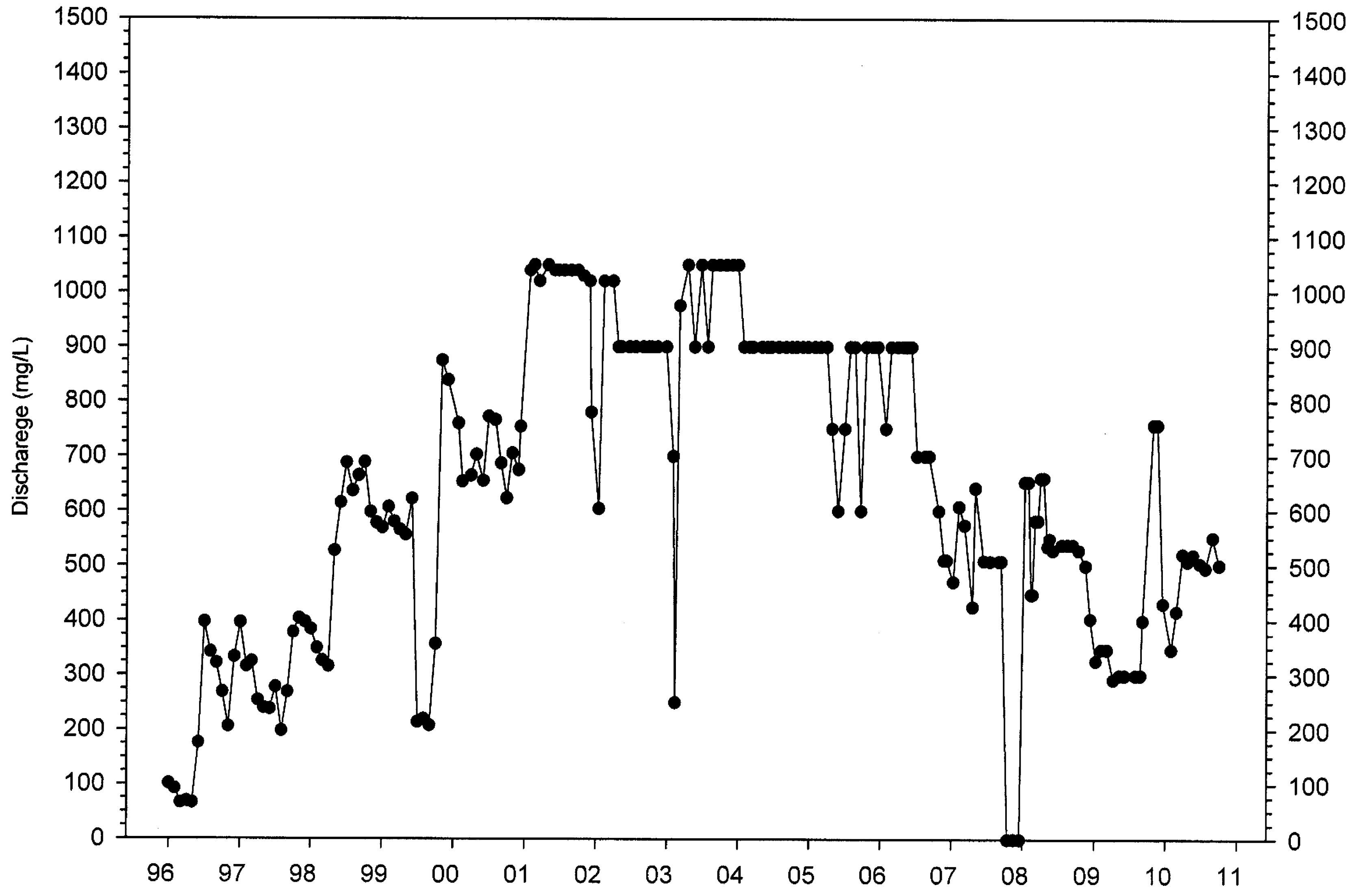


Figure PHC-1 Reported discharge for Crandall Canyon Mine (UPDES 002).

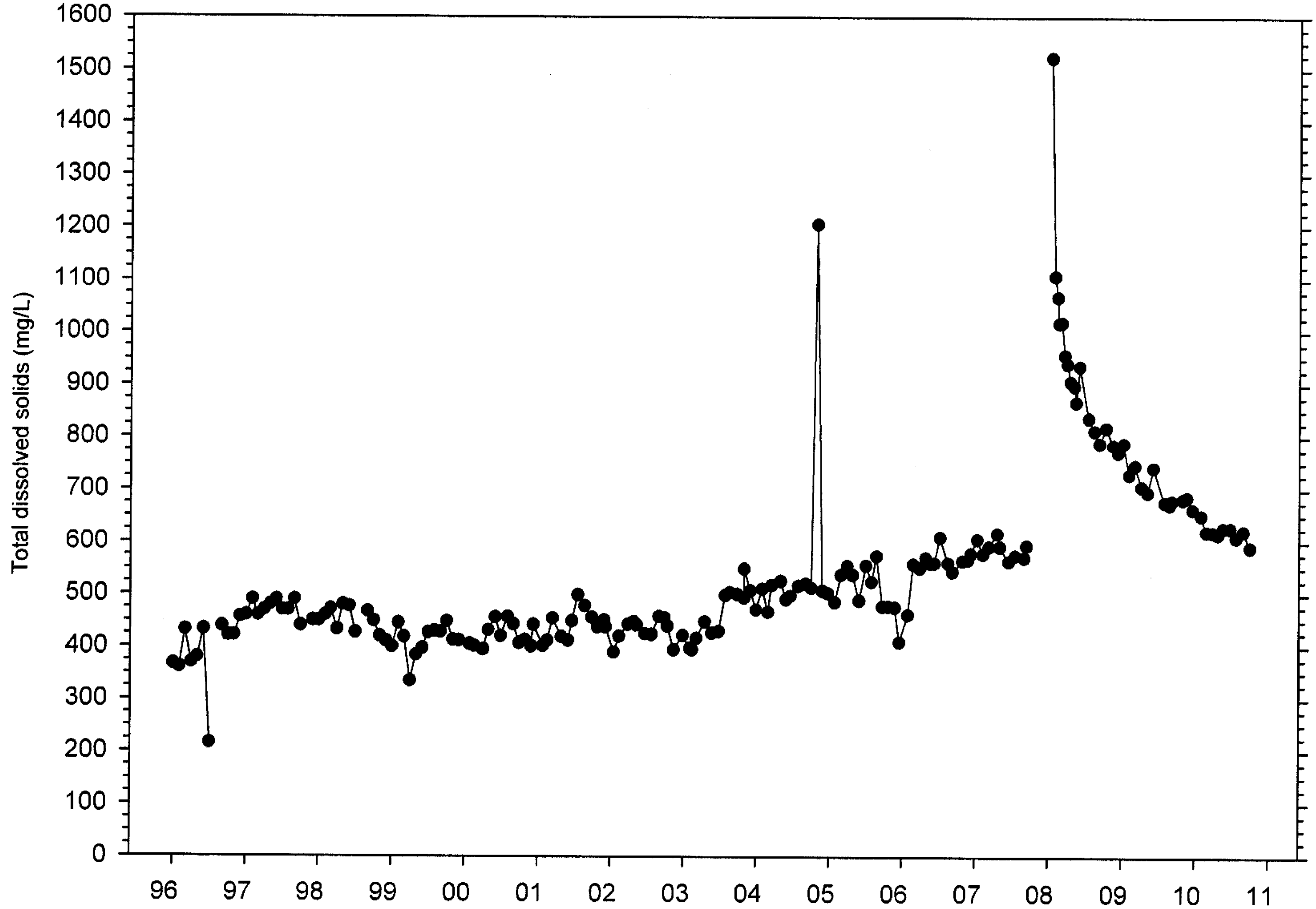


Figure PHC-2 Total dissolved solids (TDS) concentrations of Crandall Canyon Mine discharge waters.

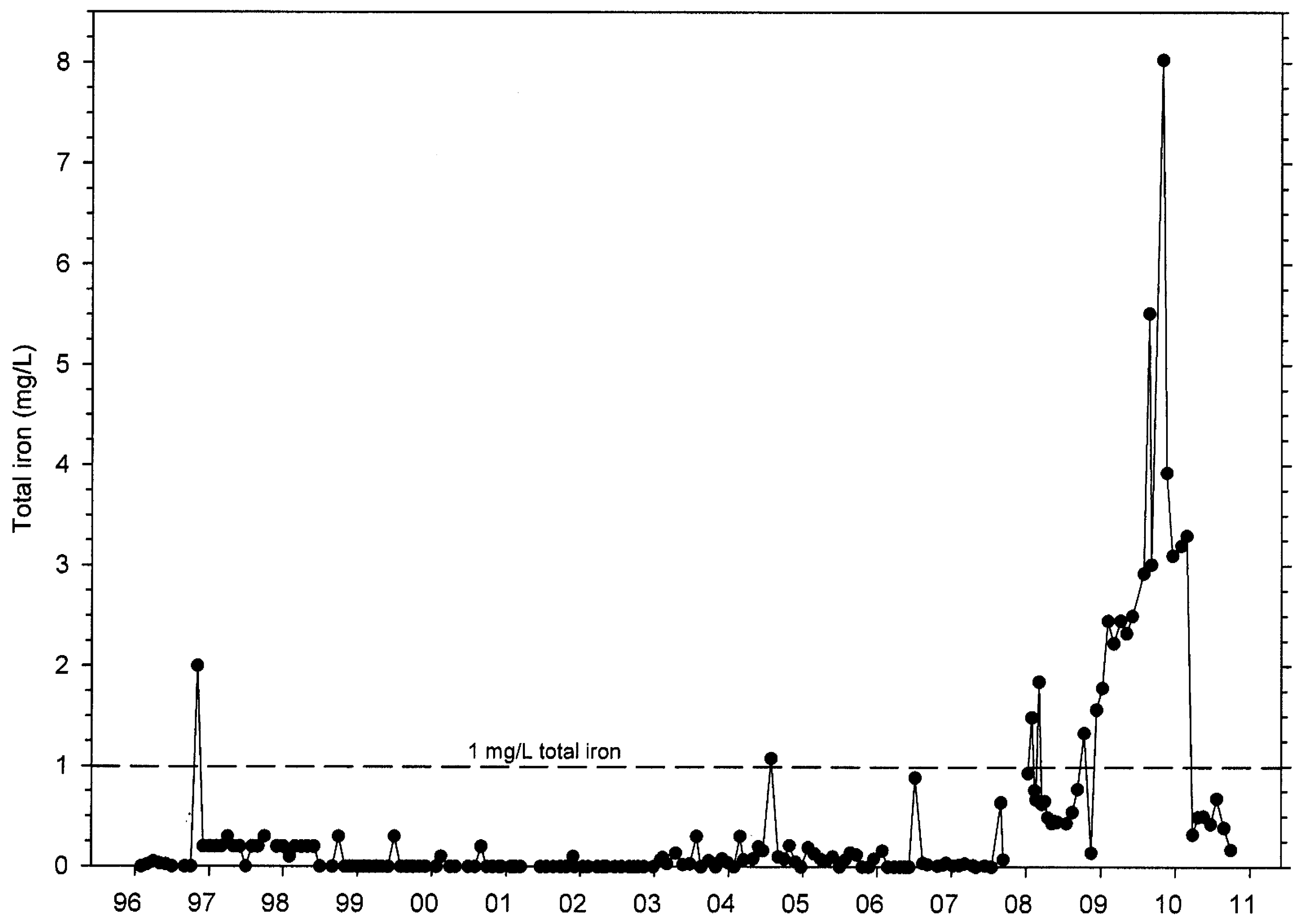


Figure PHC-3 Total iron concentrations of Crandall Canyon Mine discharge waters.

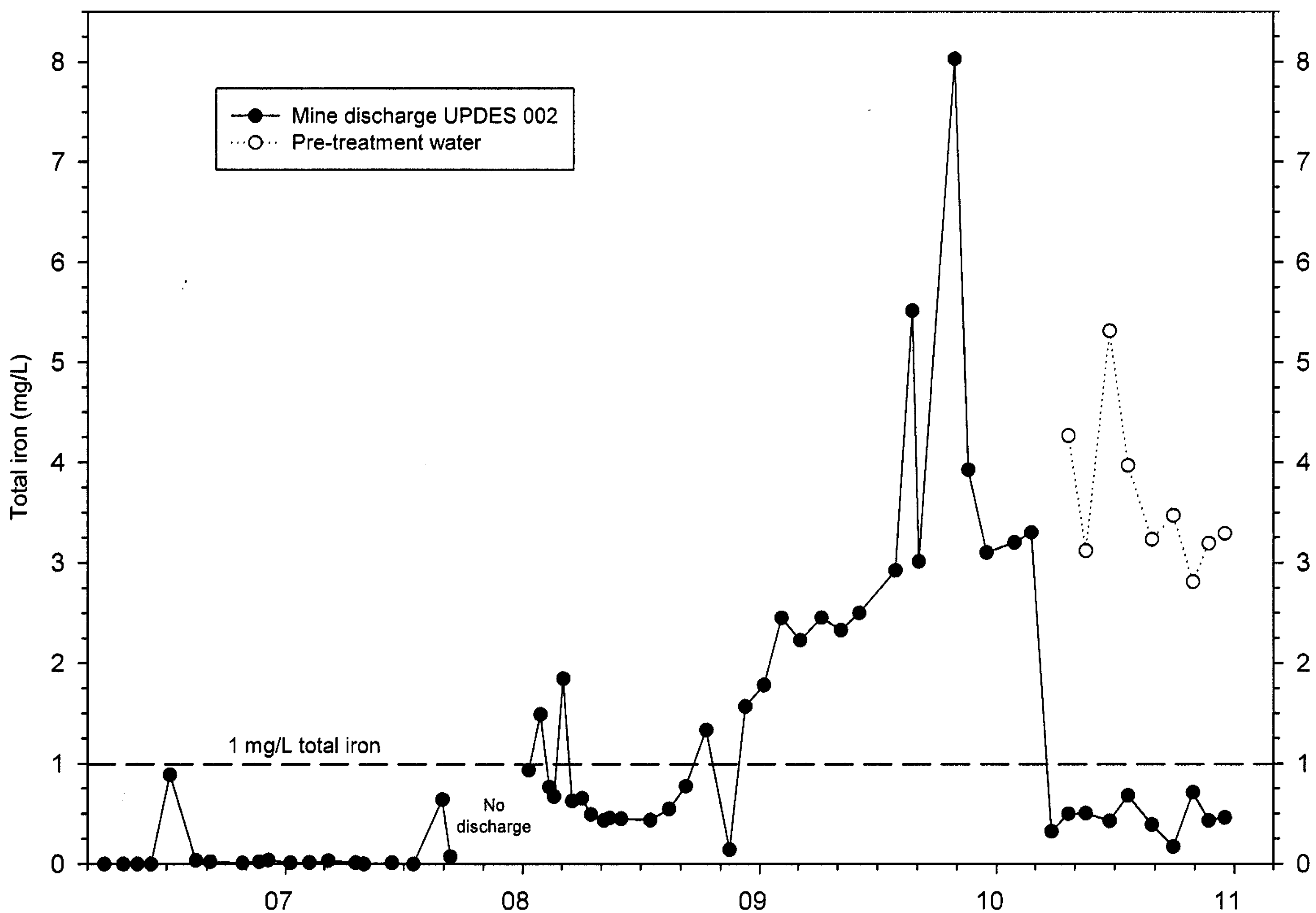
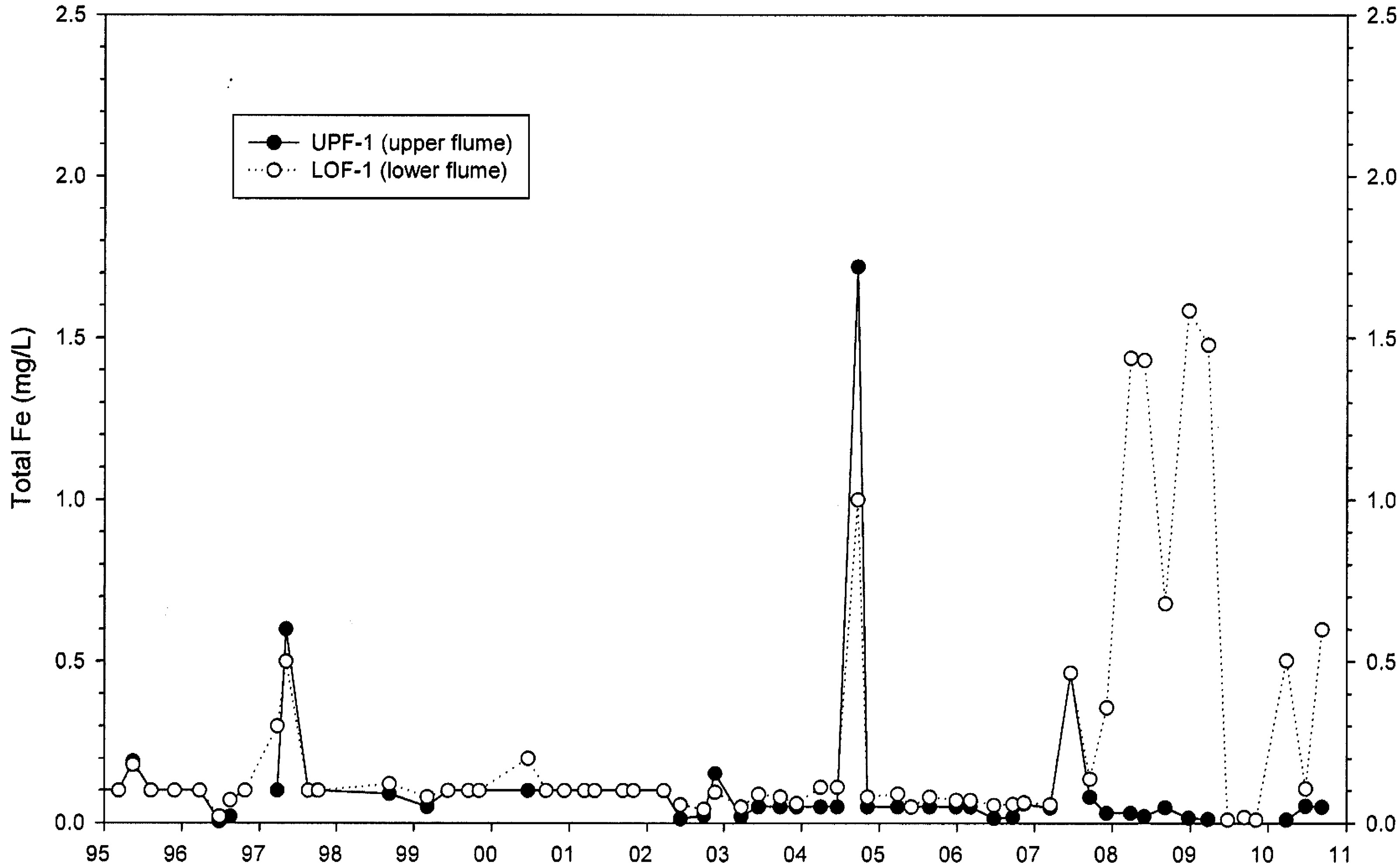


Figure PHC-4 Total iron concentrations of Crandall Canyon Mine discharge and pre-treatment water.



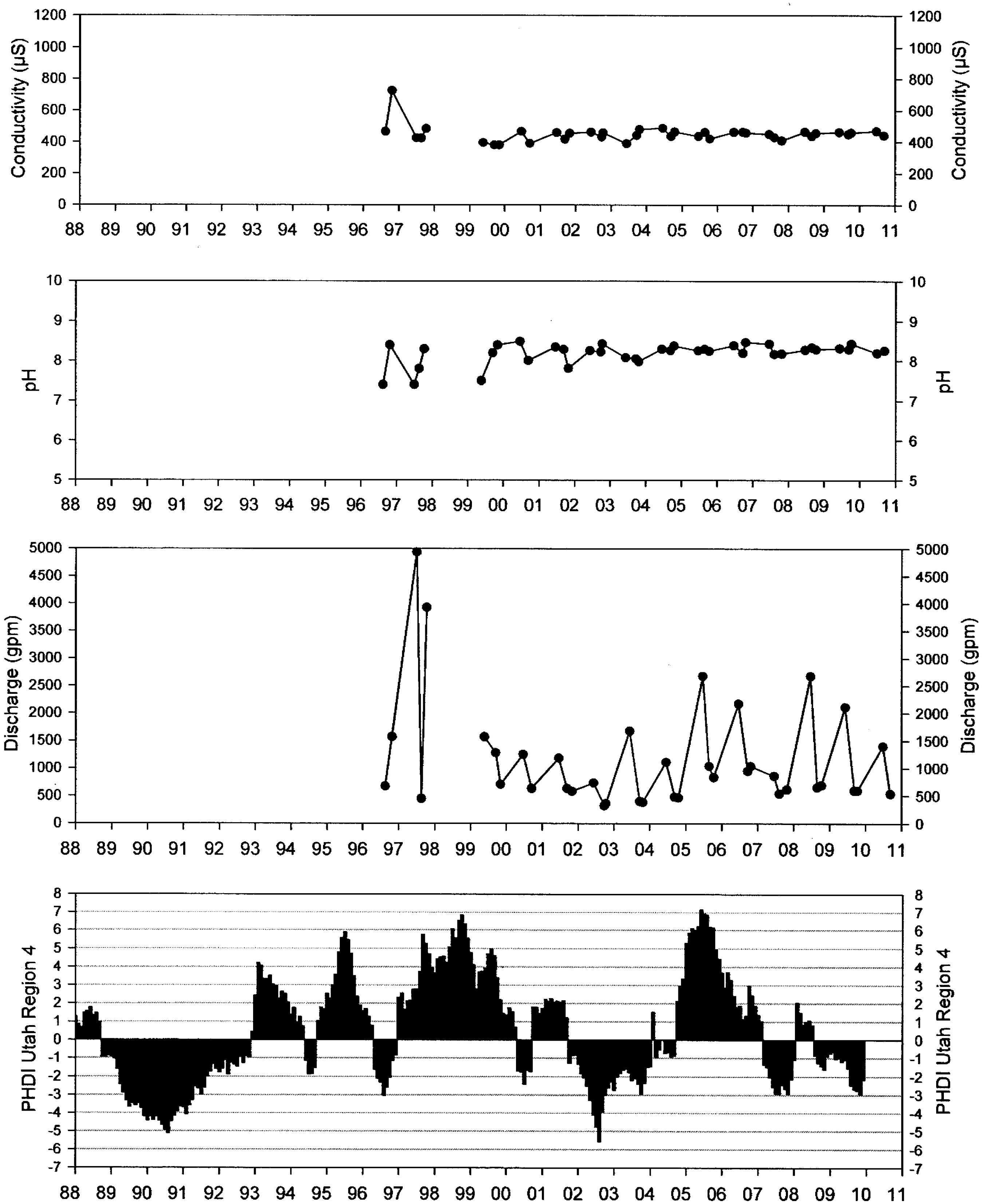
Note: for samples with non-detect laboratory results, the minimum laboratory detection limit value is plotted.

Figure PHC-5 Total iron concentrations in Crandall Creek water as measured at the upper and lower flumes.

PHC Attachment 1

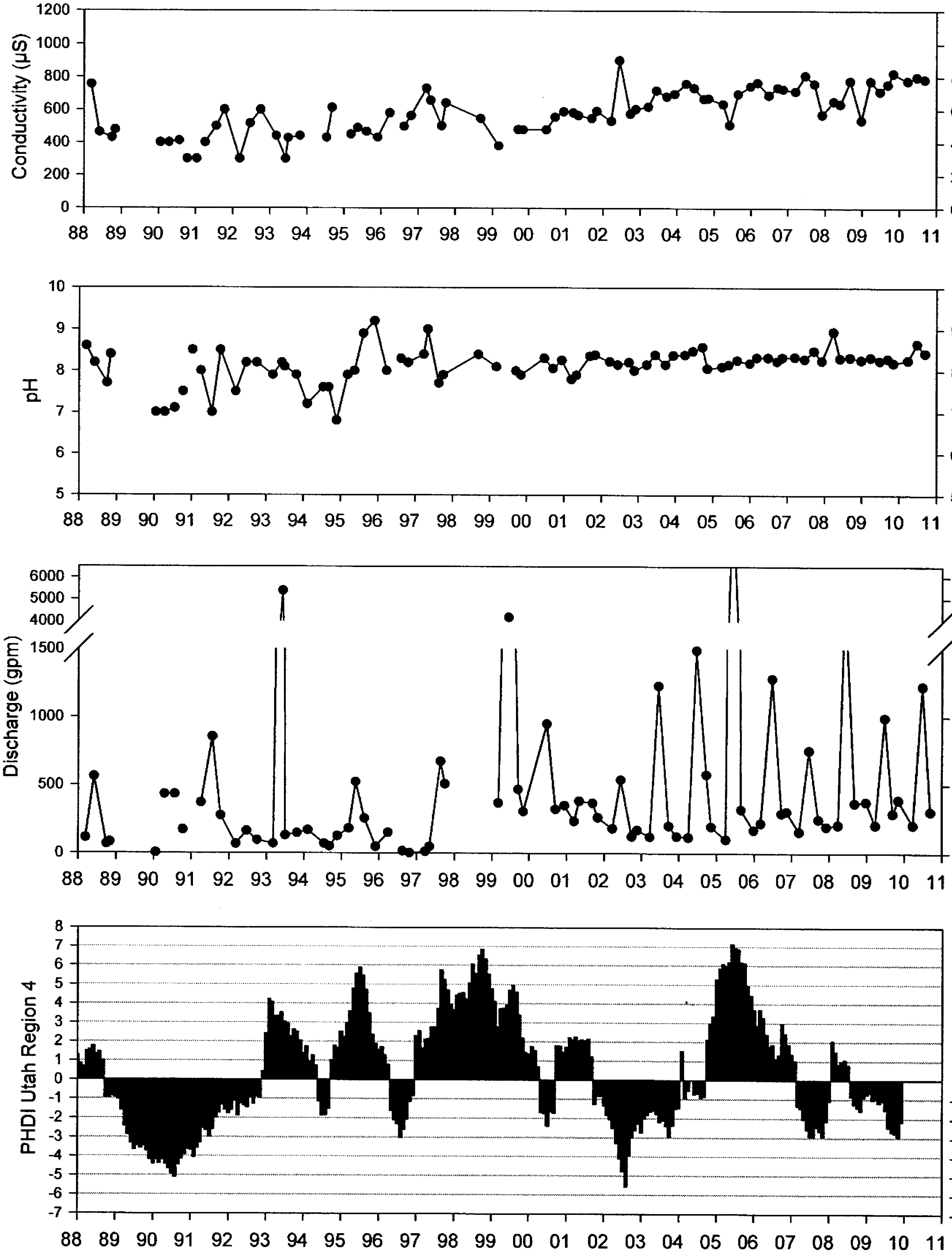
Monitoring data graphs

Indian Creek



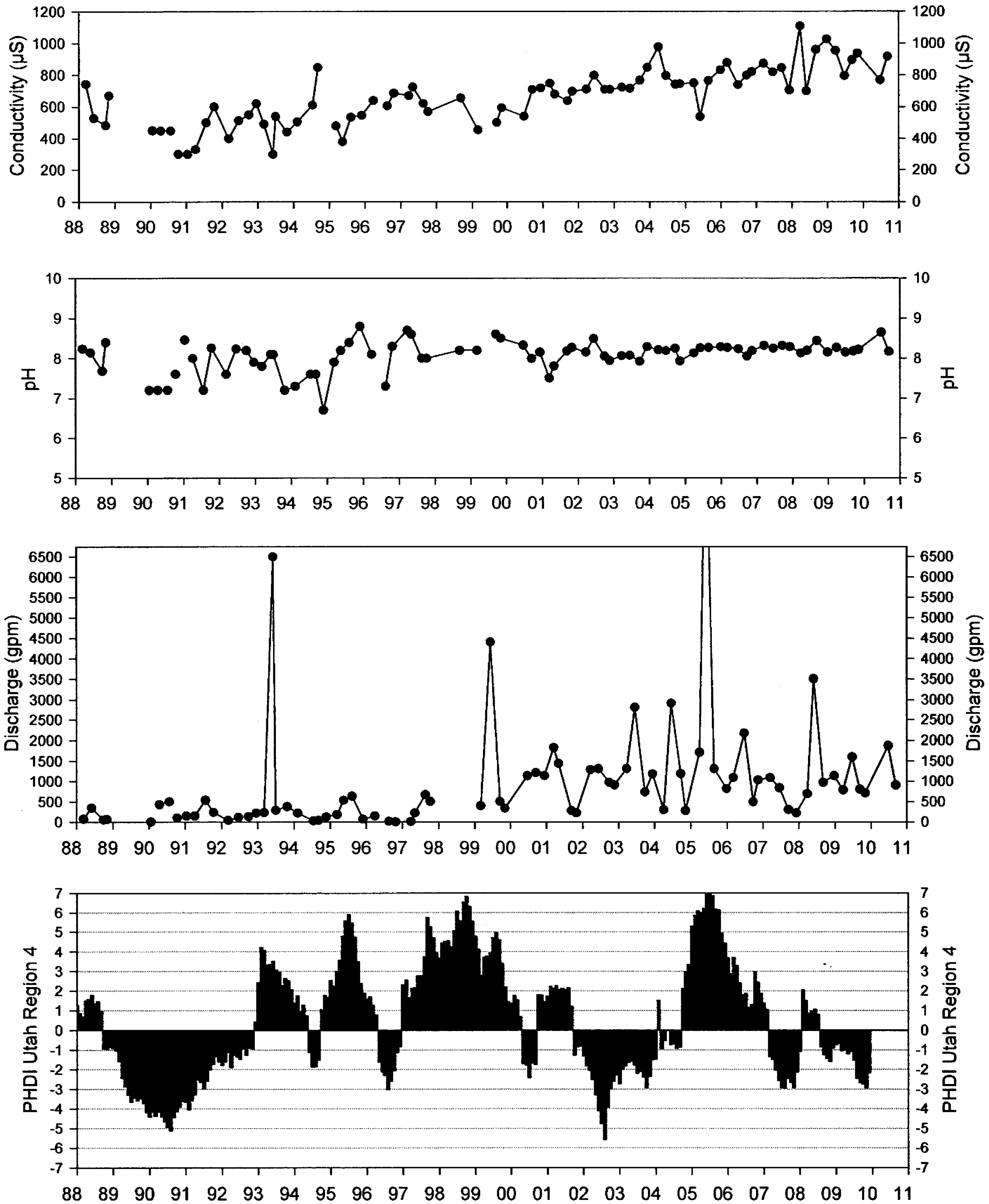
Note: Discharge values for some monitoring events at Indian Creek were modified using corrected head/discharge equation.

Crandall Canyon Upper Flume



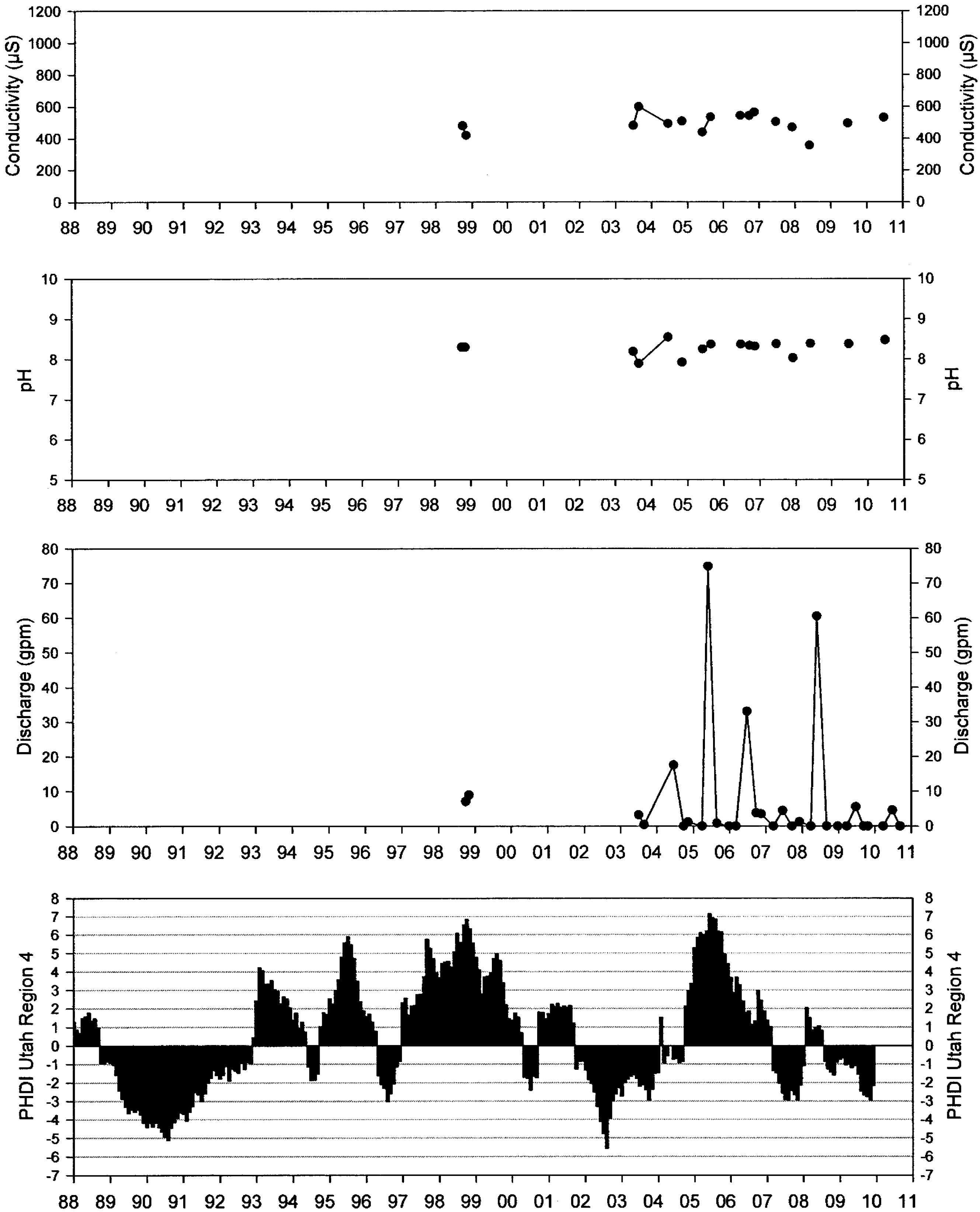
Note: Discharge values for some monitoring events at UPF-1 were modified using corrected head/discharge equation.

Crandall Canyon Lower Flume

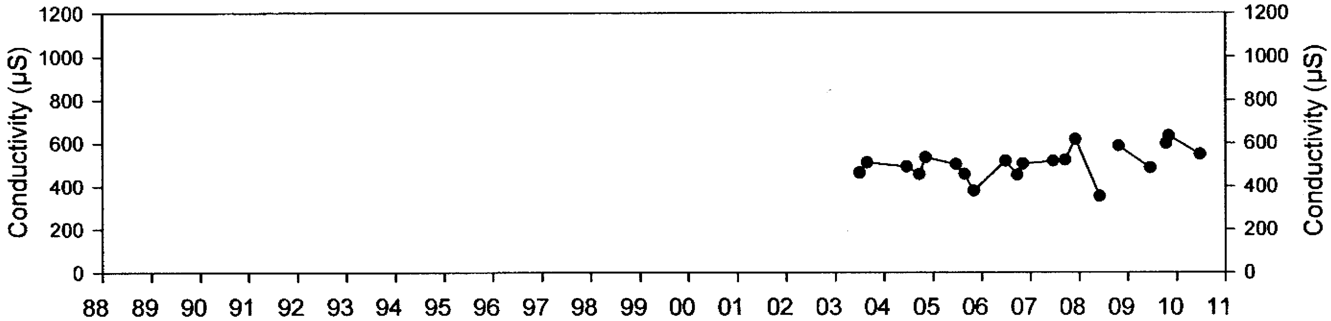


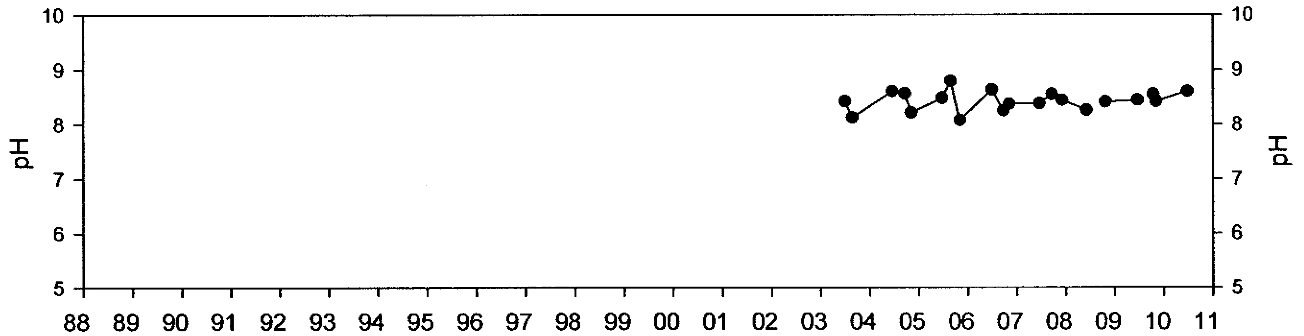
Note: Discharge values for some monitoring events at LOF-1 were modified using corrected head/discharge equation.

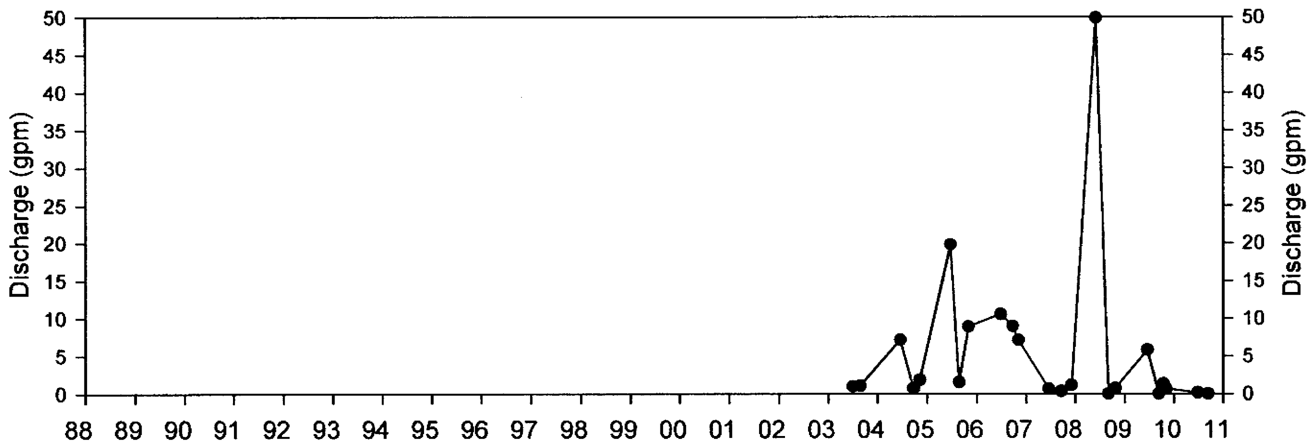
IBC-1

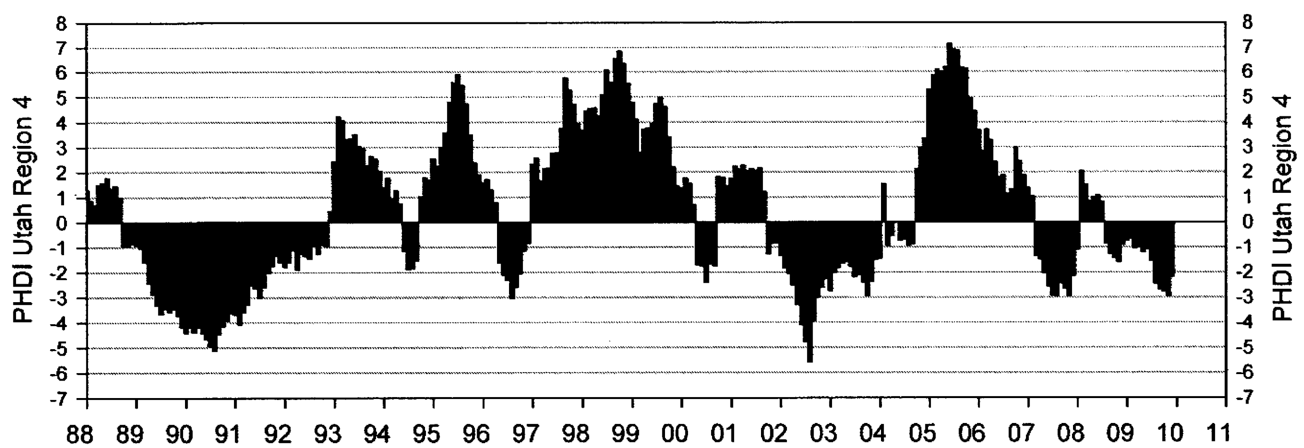

Conductivity (µS)
pH
Discharge (gpm)
PHDI Utah Region 4
88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11

Section 5 Creek

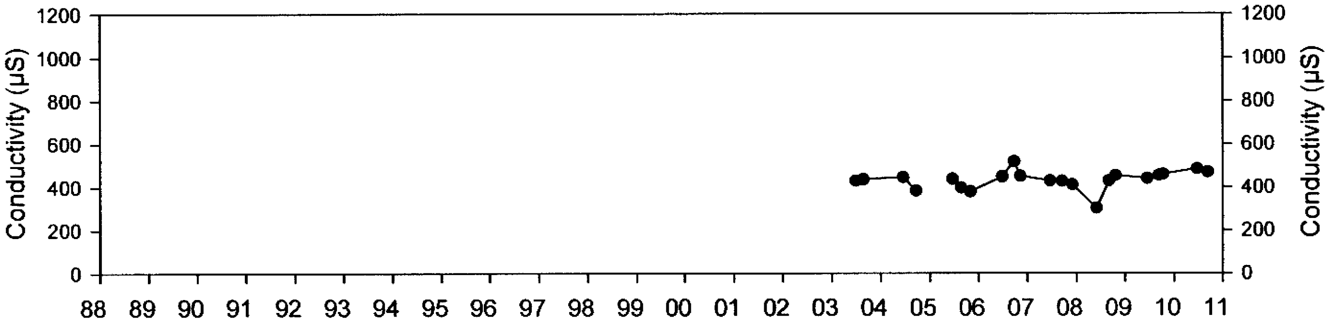


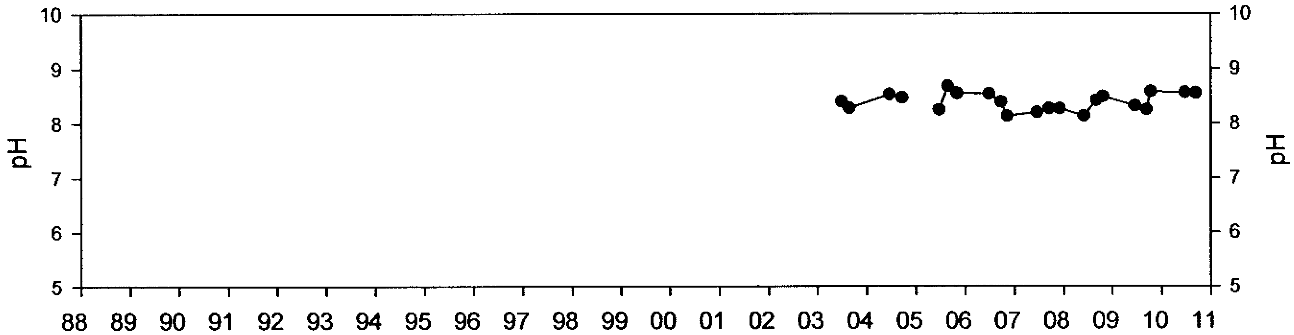


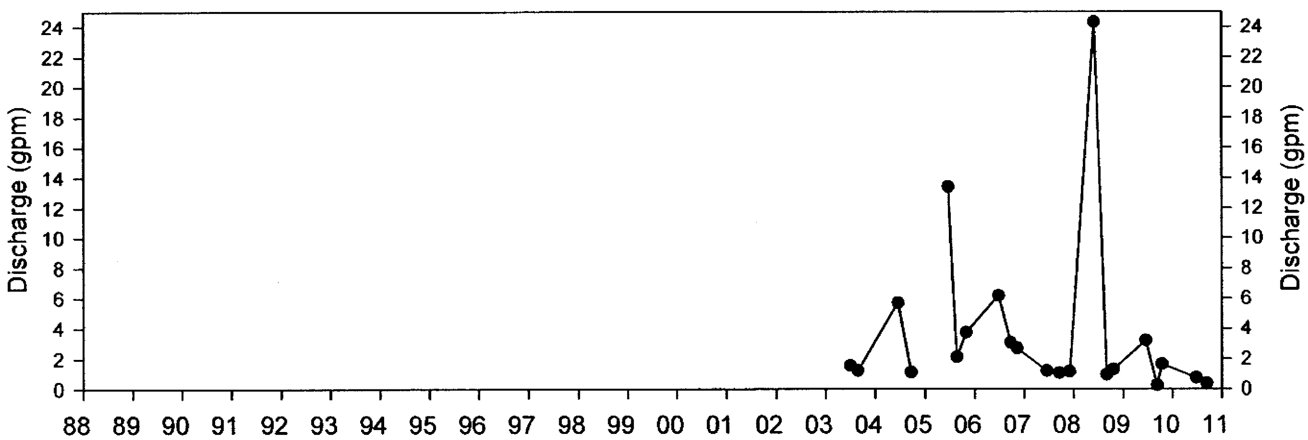


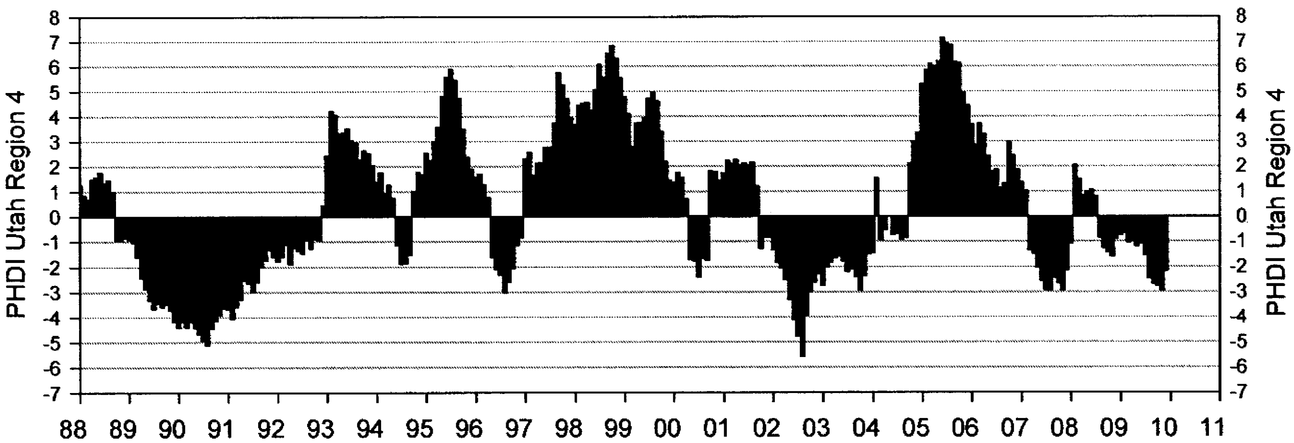


Section 5 U.L. Creek

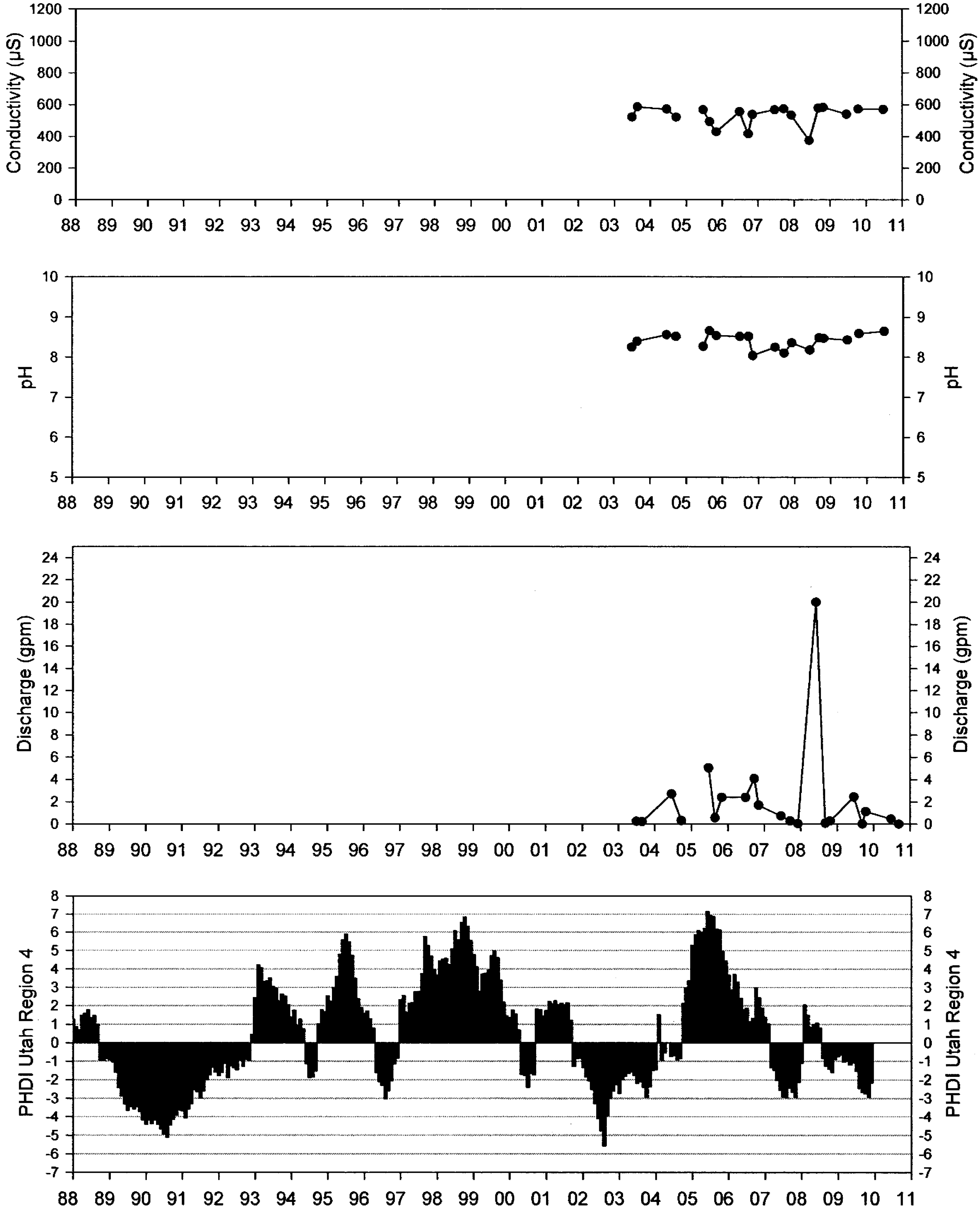




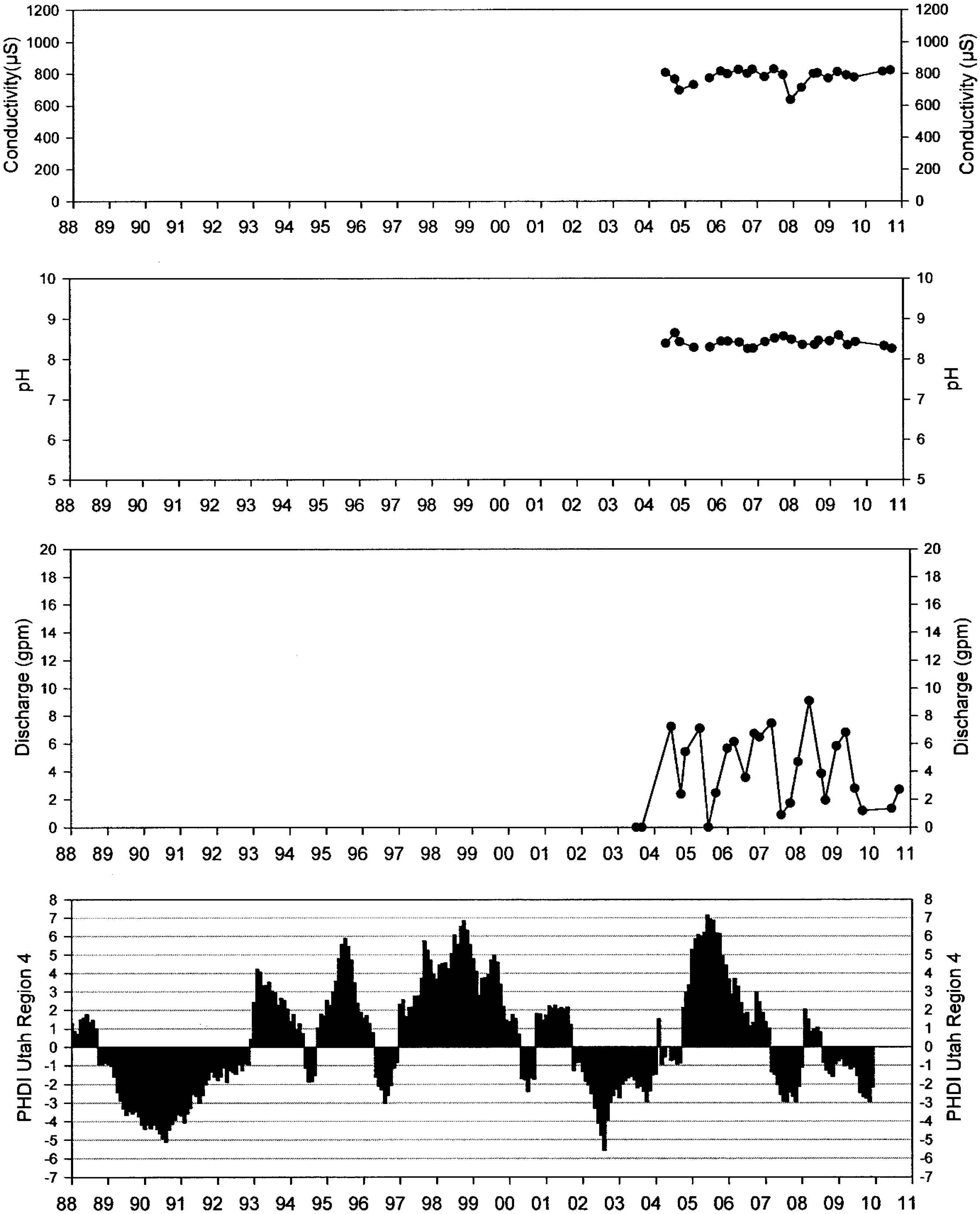




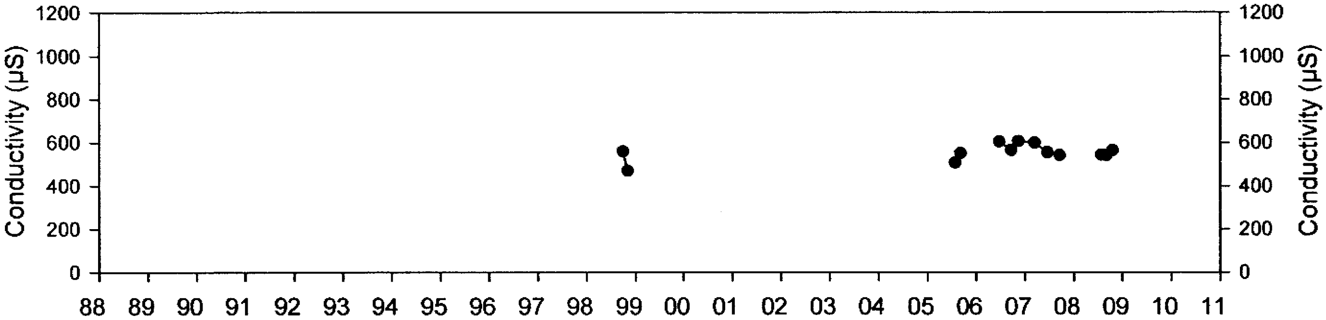
Section 5 U.R. Creek

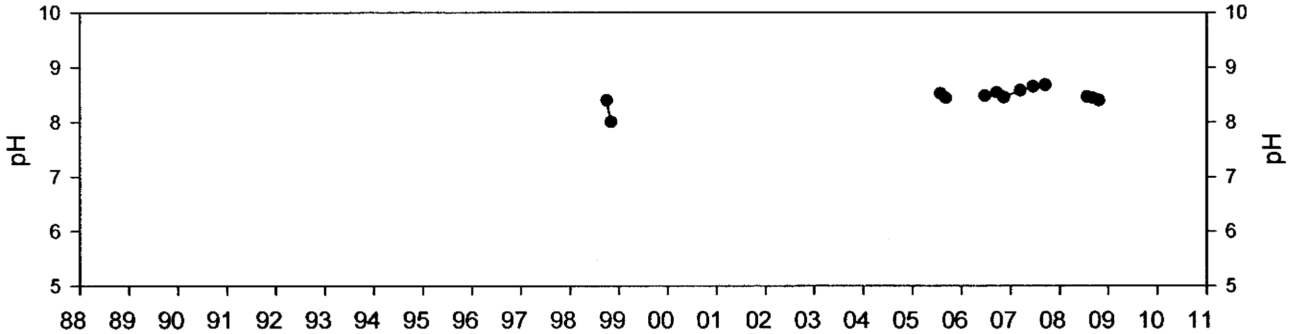


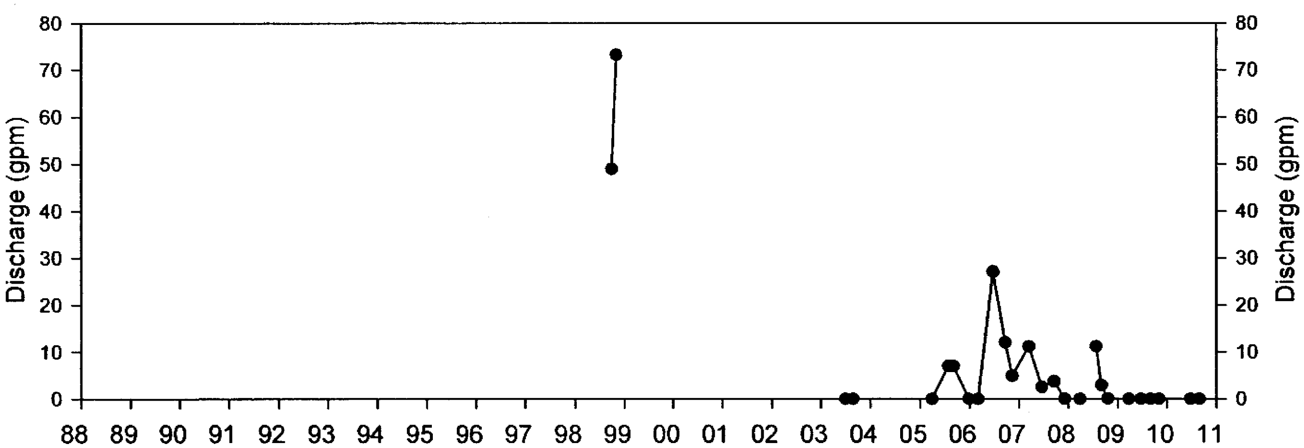
Section 4 Creek

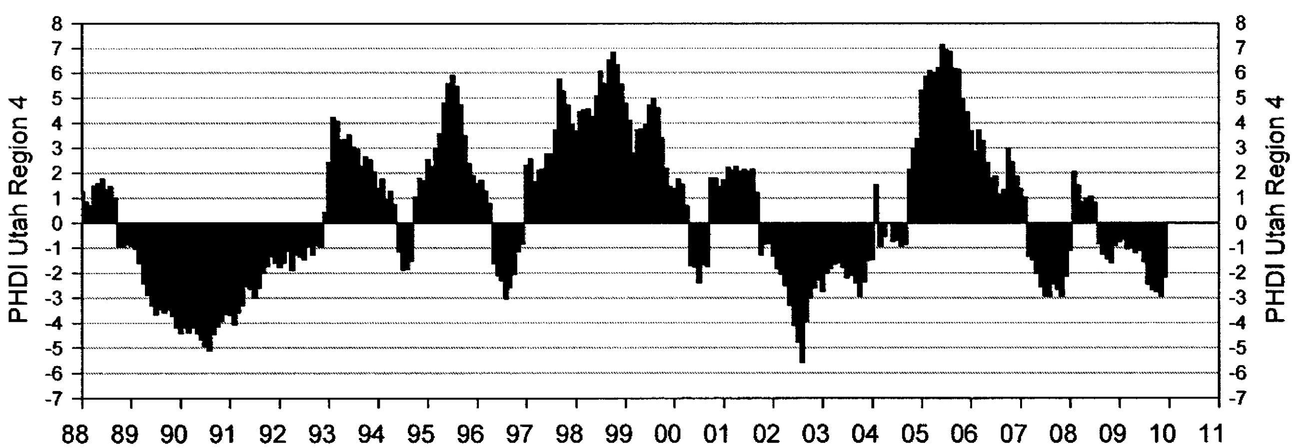


Little Bear Creek

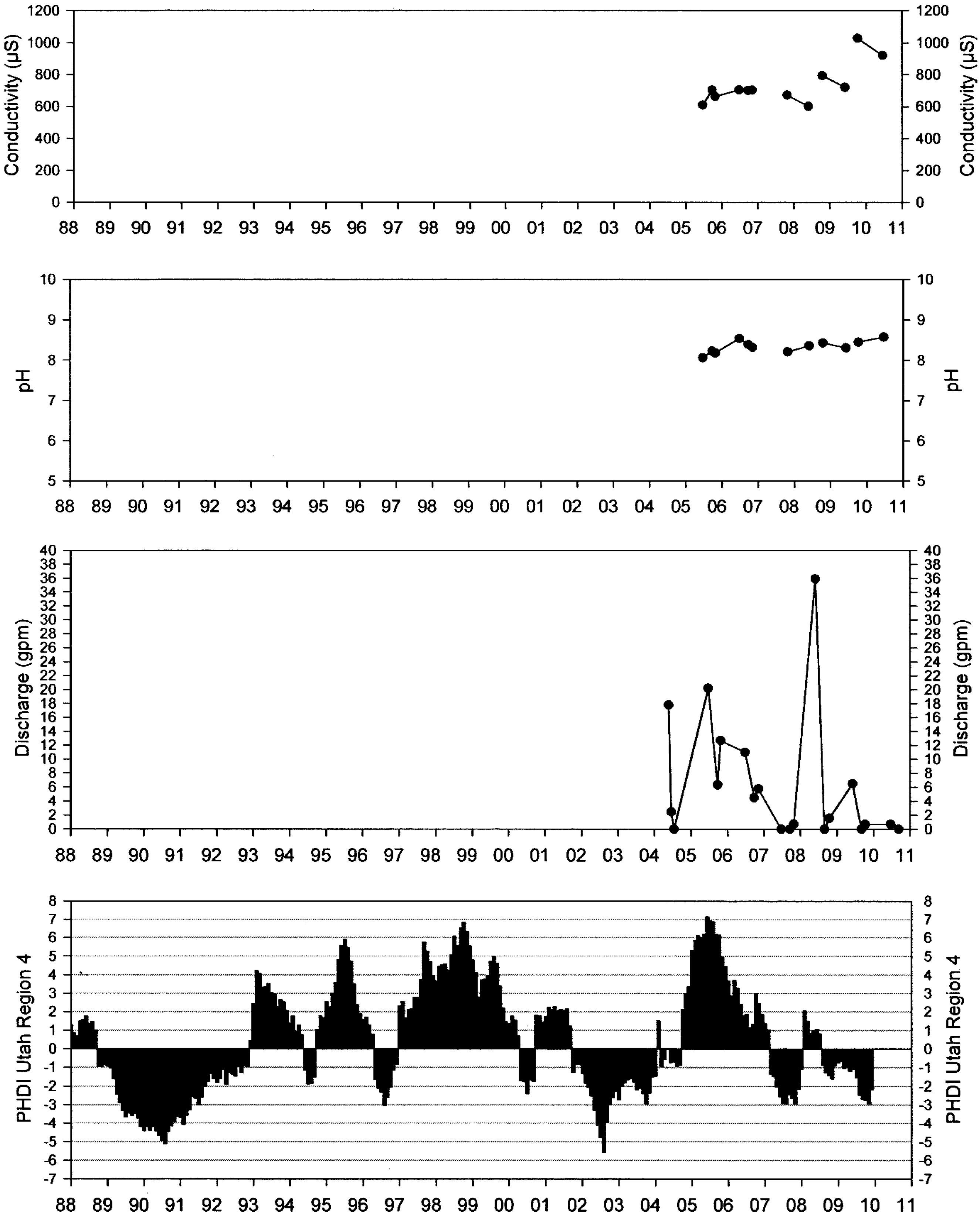




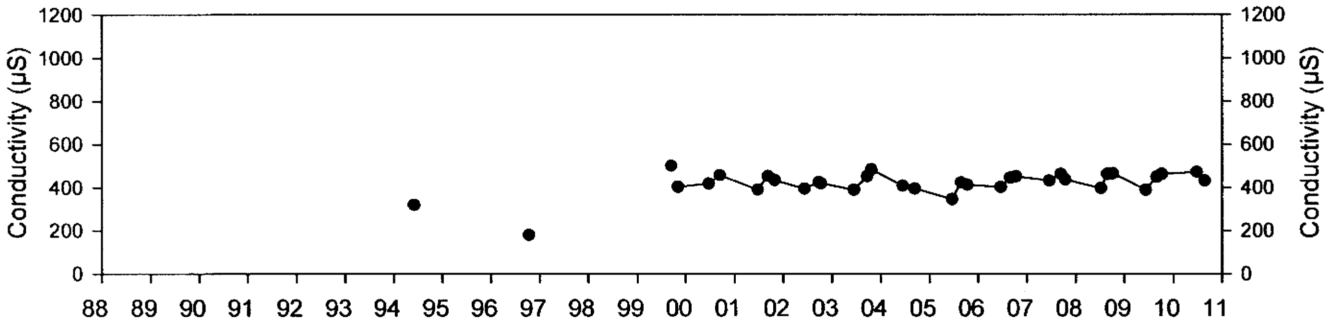


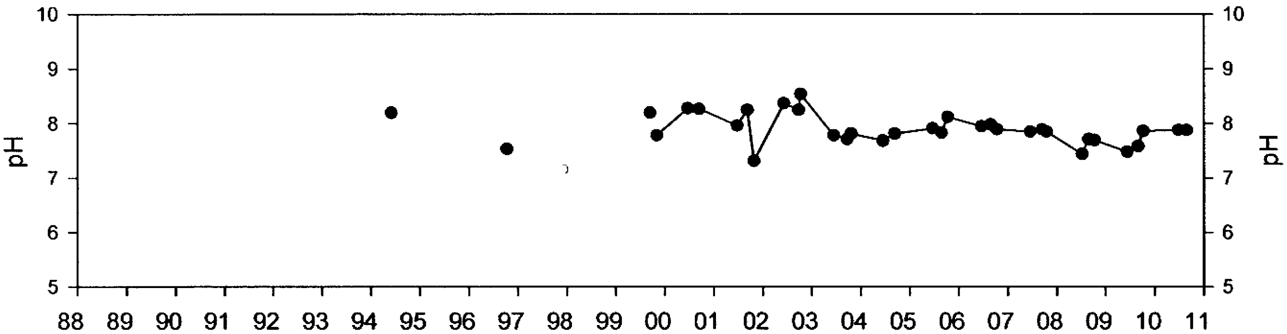


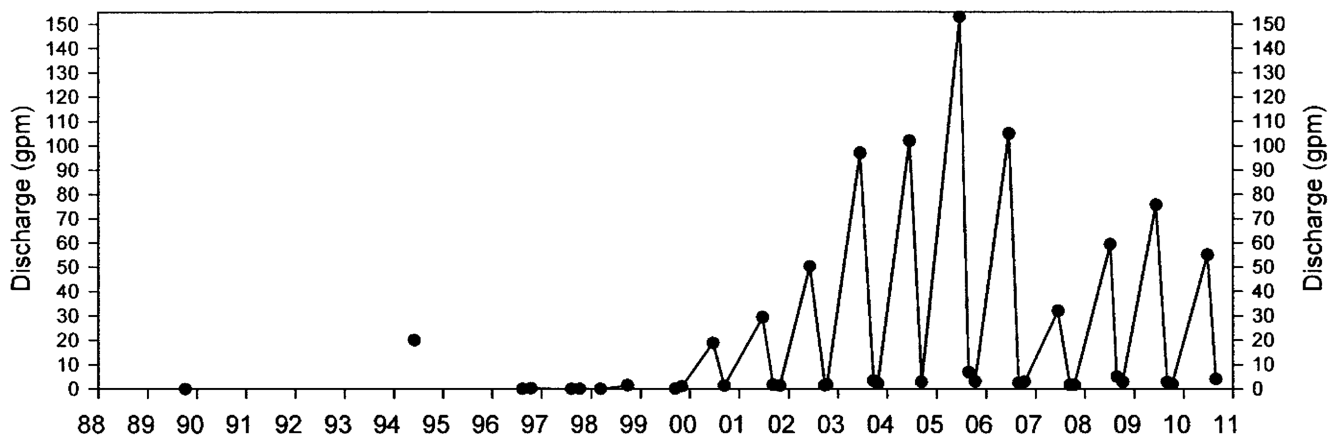
Shingle Creek

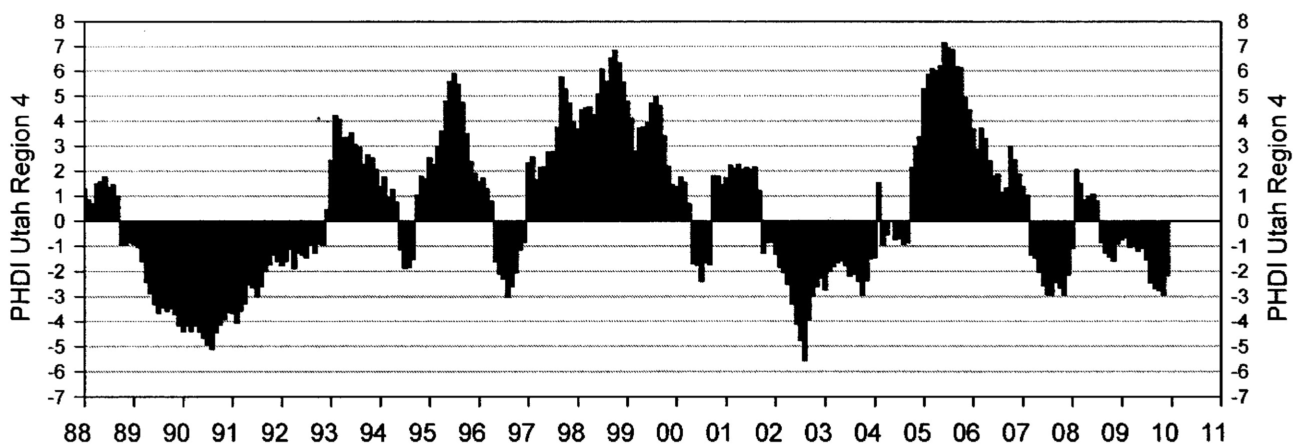


SP1-19

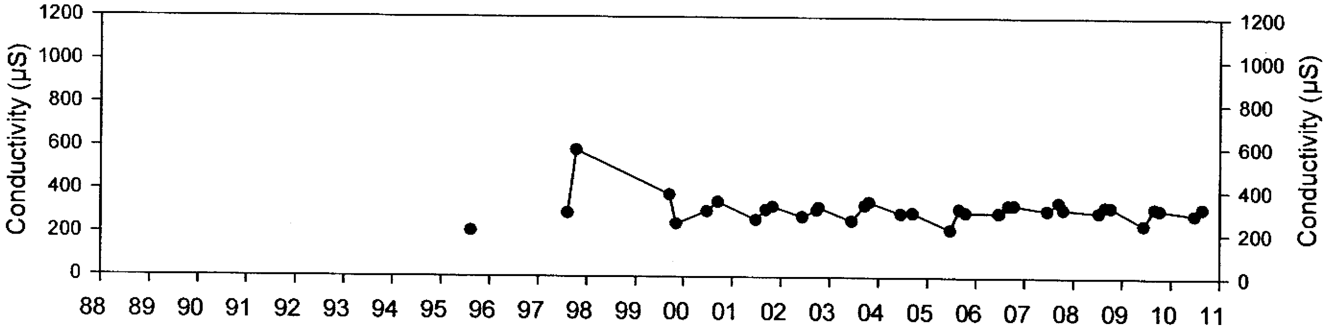

Conductivity (µS)
Conductivity (µS)


pH
pH

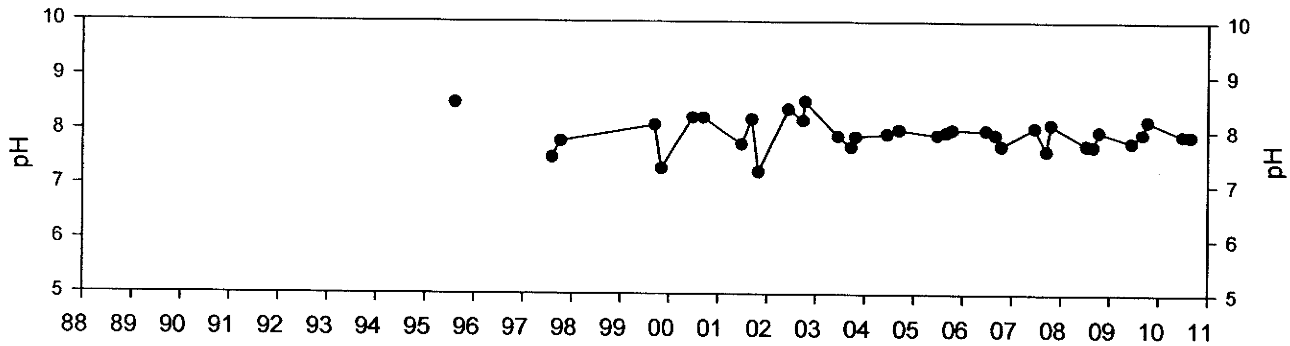

Discharge (gpm)
Discharge (gpm)


PHDI Utah Region 4
PHDI Utah Region 4

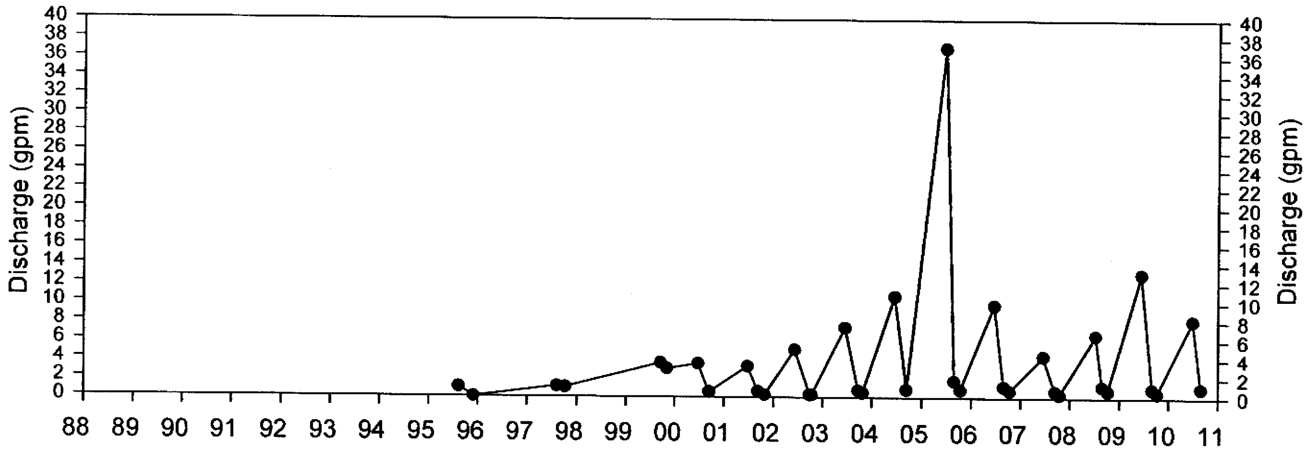
SP1-22



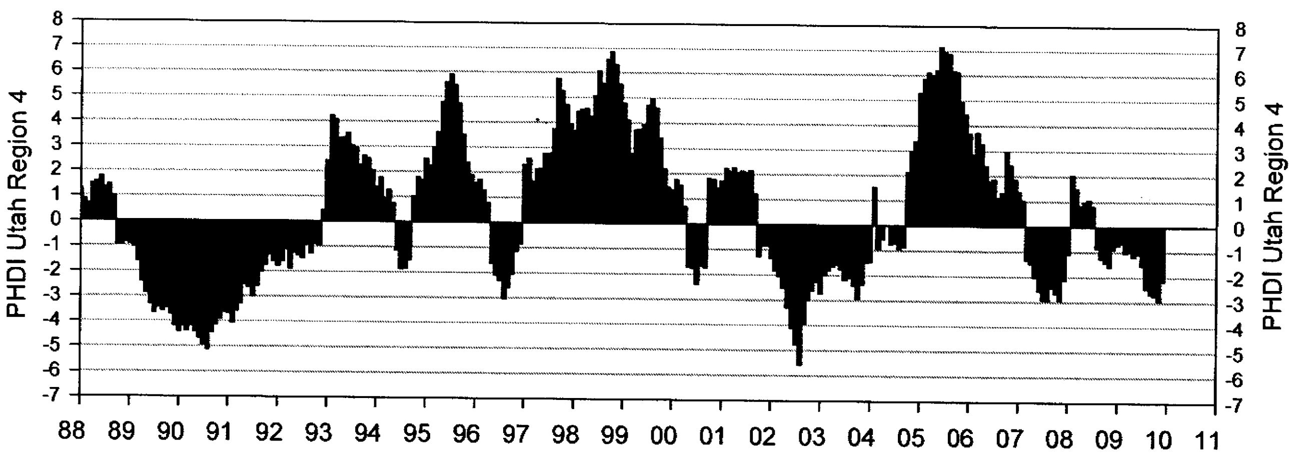
Conductivity (µS)
0
200
400
600
800
1000
1200
88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11



pH
5
6
7
8
9
10
88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11

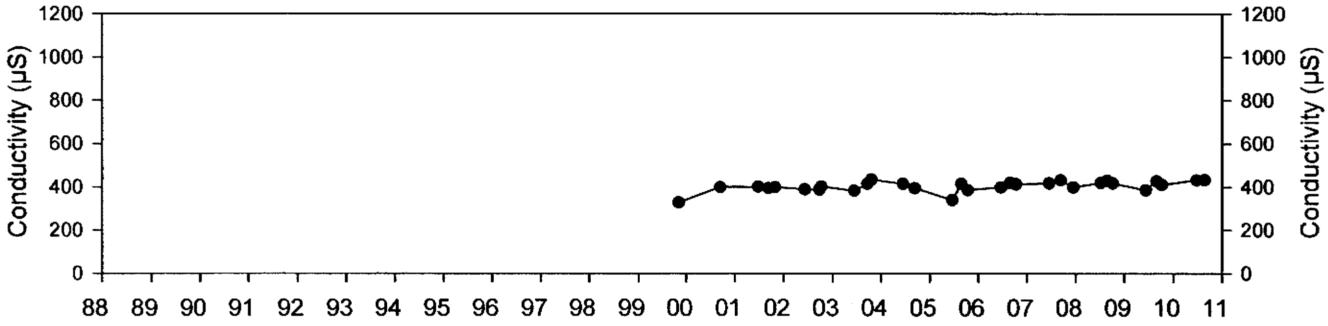


Discharge (gpm)
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40
88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11



PHDI Utah Region 4
-7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8
88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11

SP1-24



Conductivity (µS)
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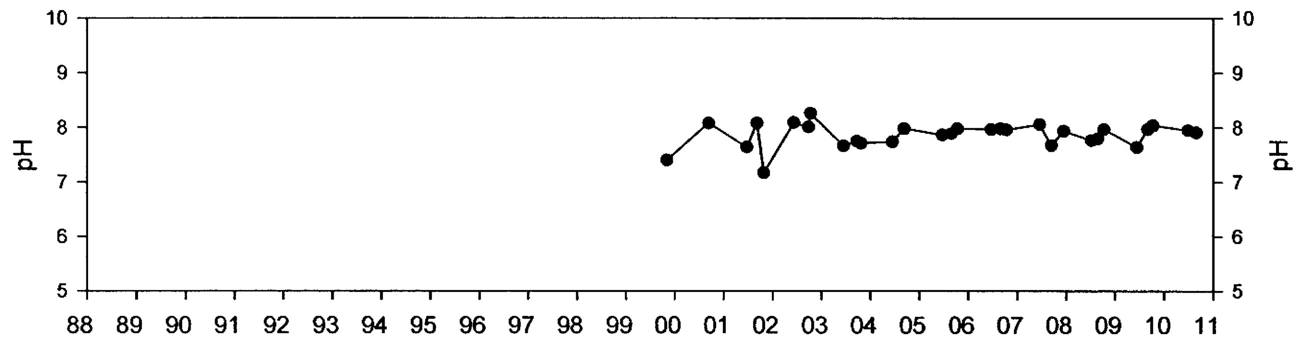
200
400
600
800
1000
1200
88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11



pH
5
6
7
8
9
10
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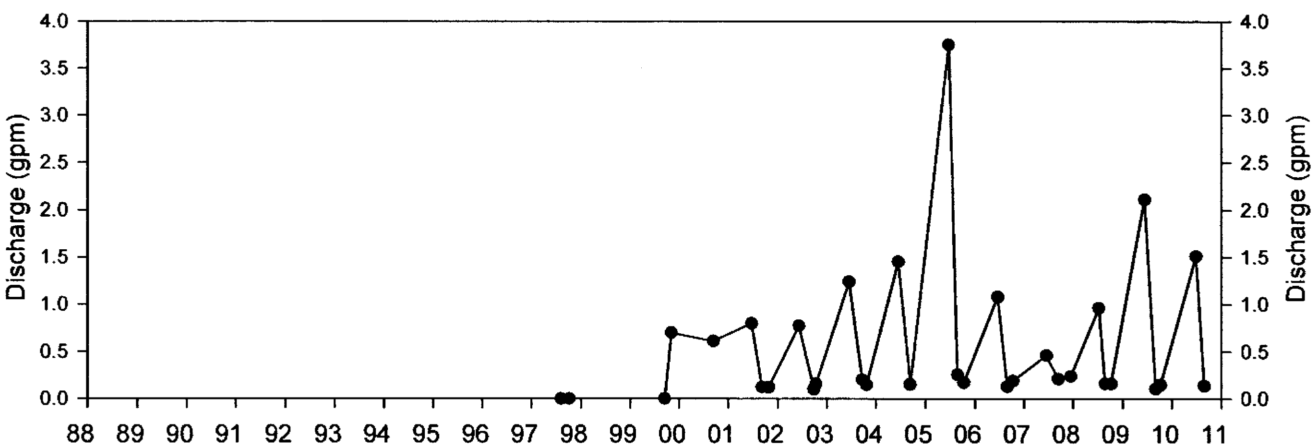

Discharge (gpm)
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
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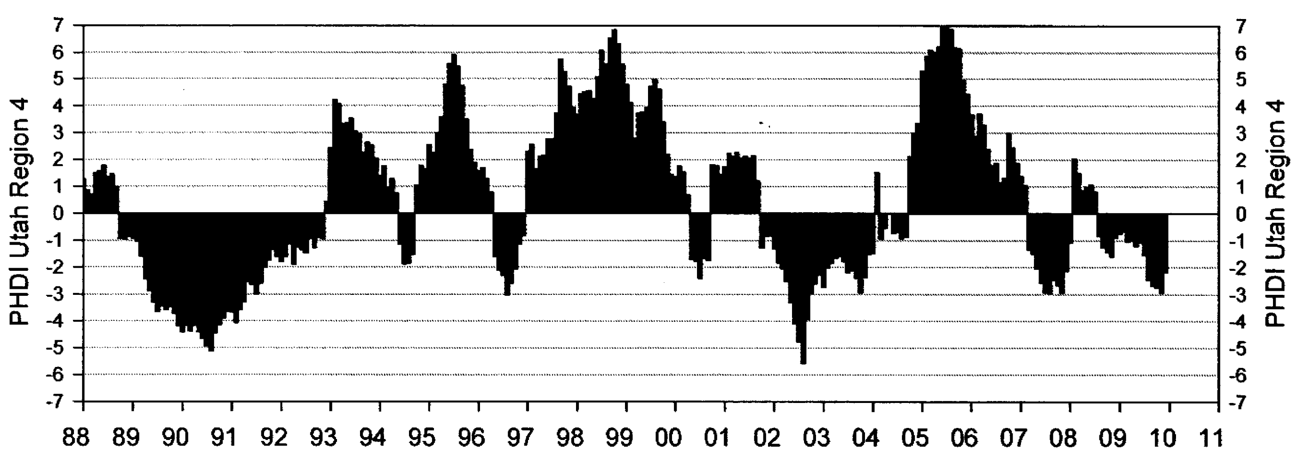

PHDI Utah Region 4
-7
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-5
-4
-3
-2
-1
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6
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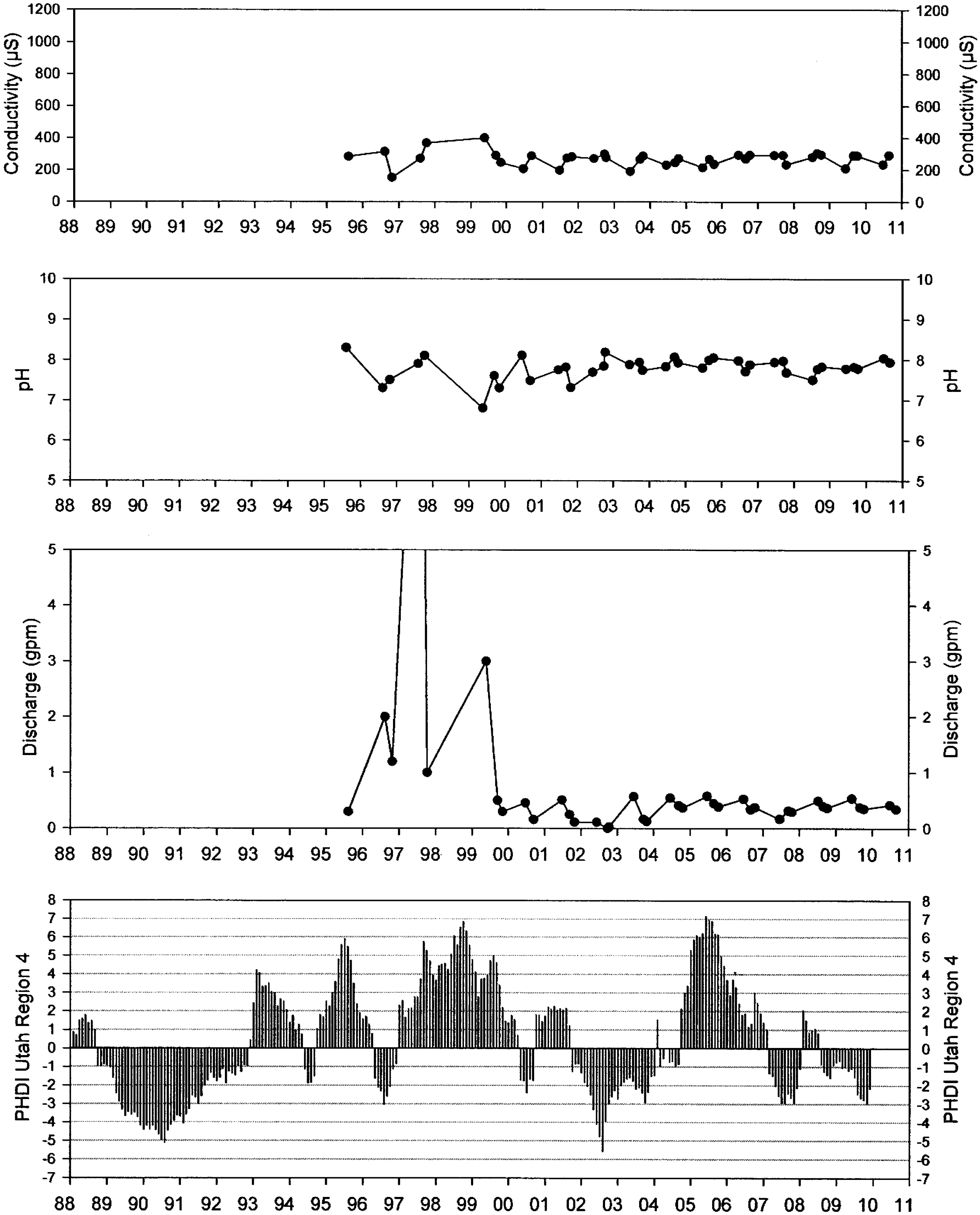
SP1-3



Conductivity (µS)
pH
Discharge (gpm)
PHDI Utah Region 4
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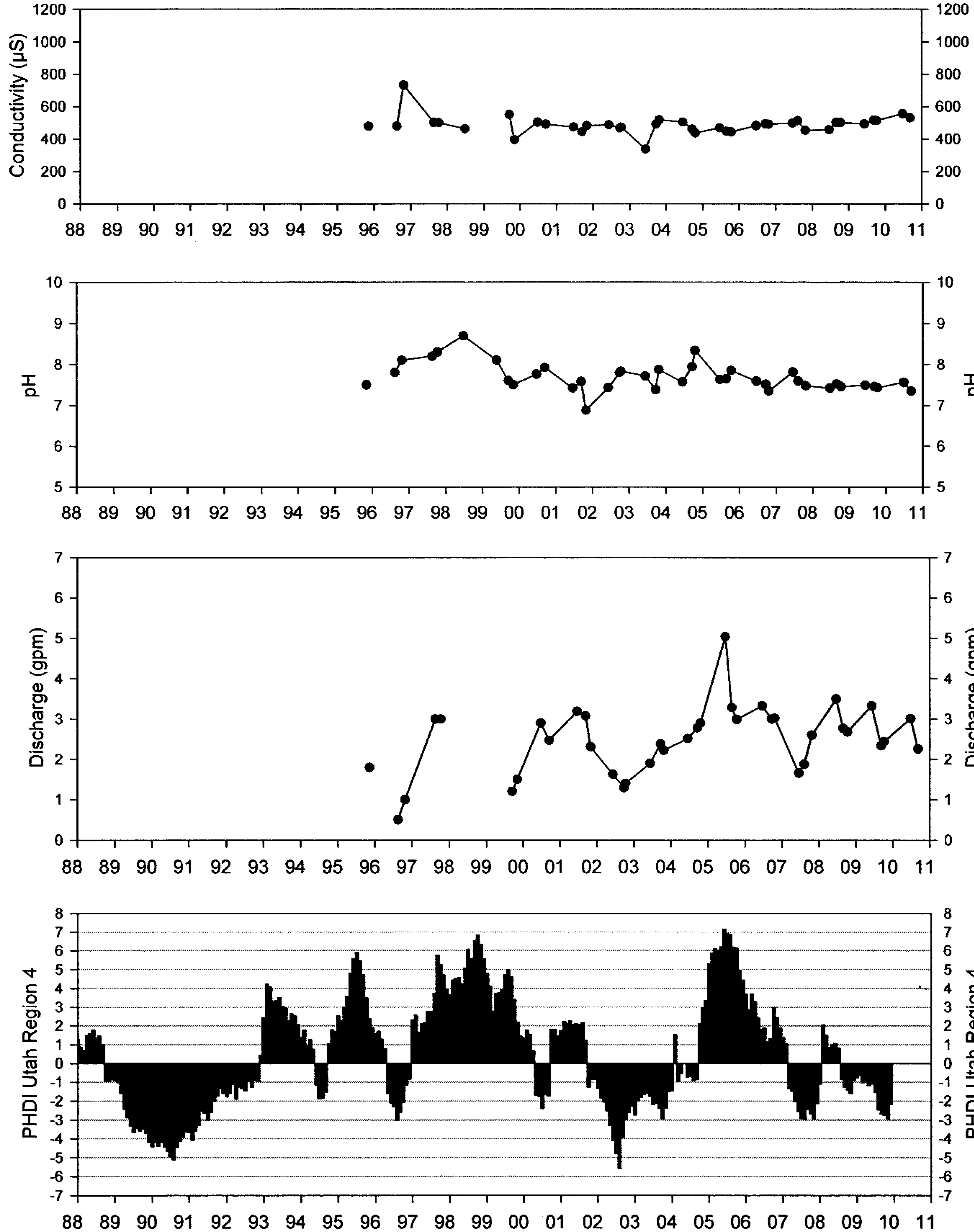
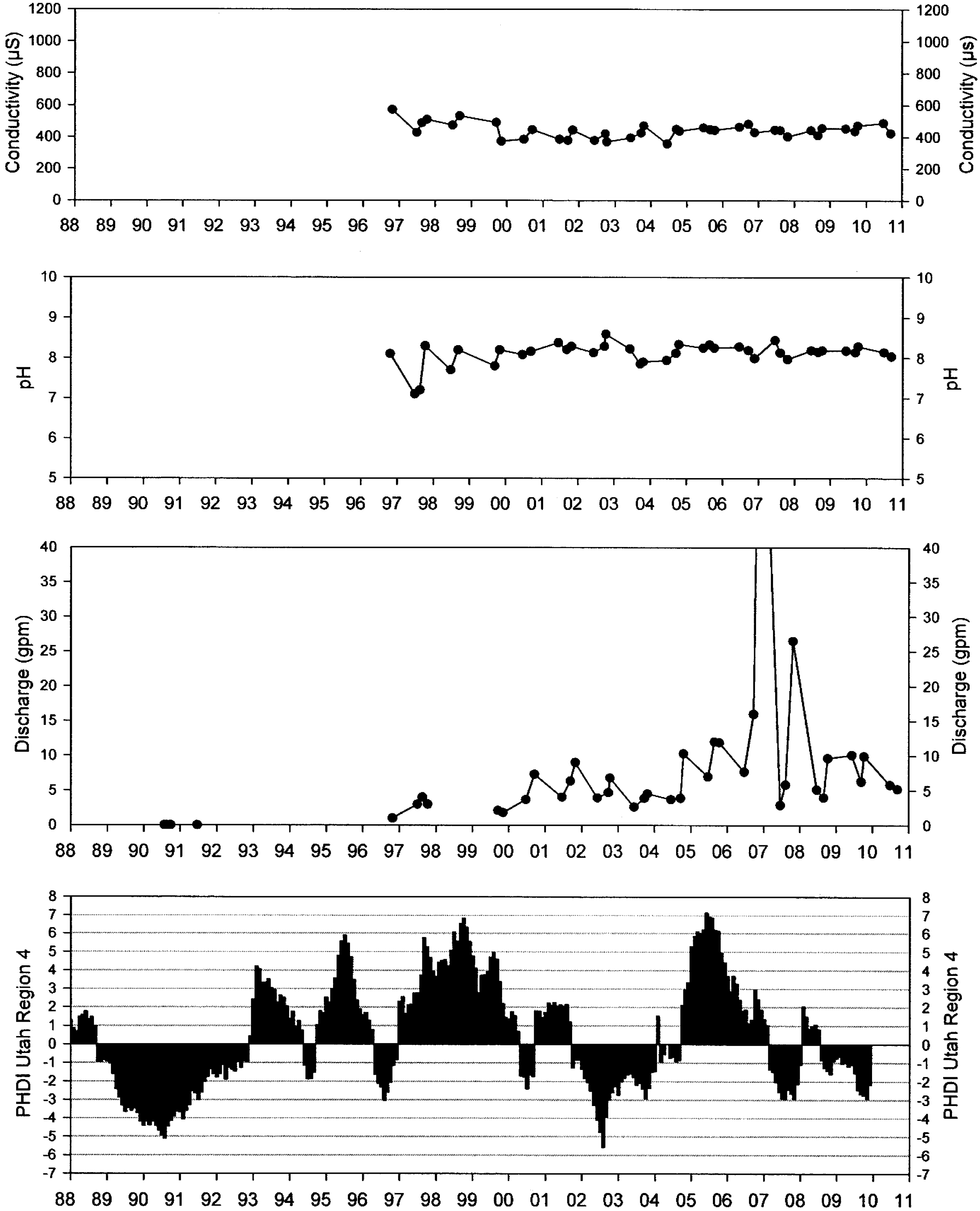
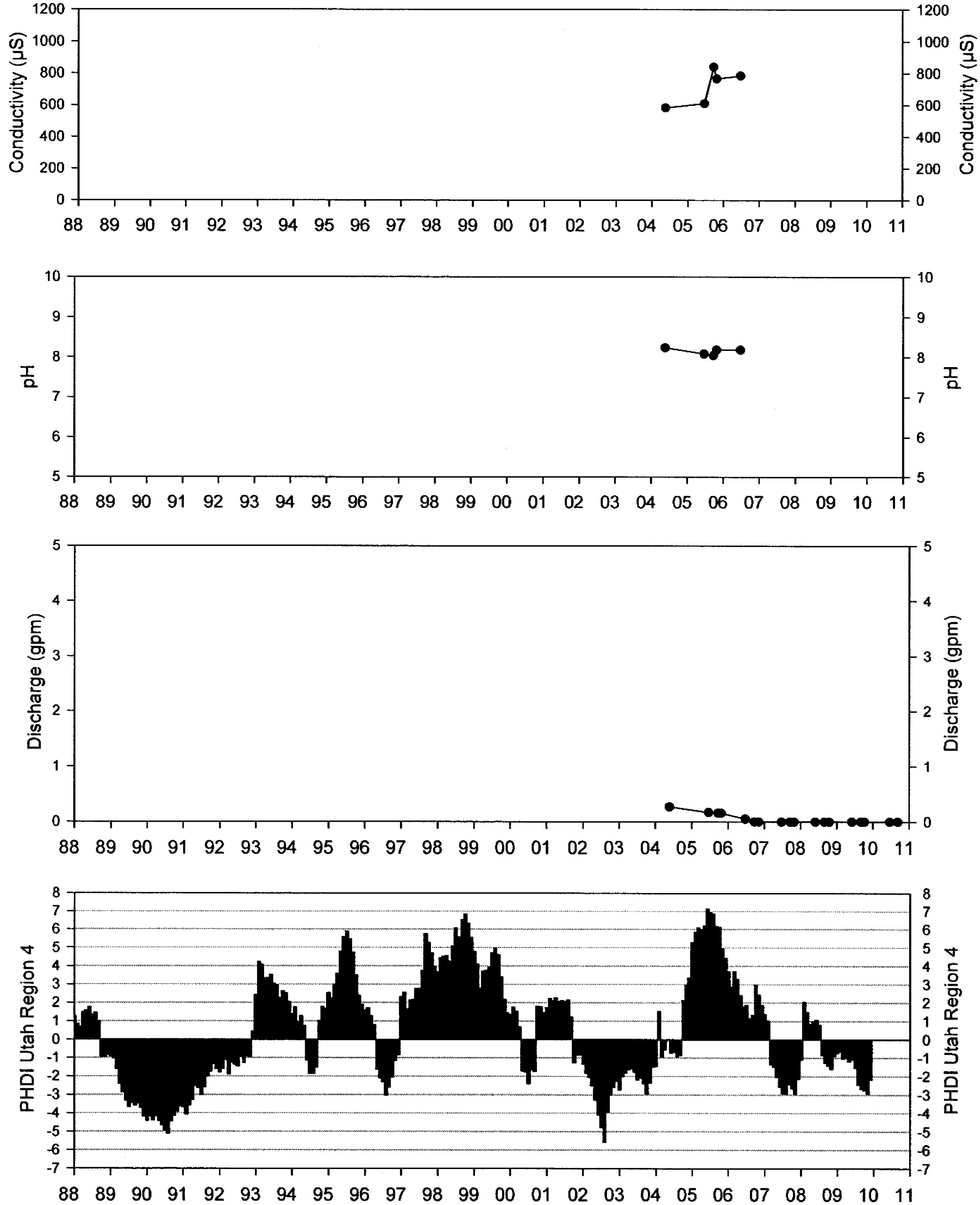
SP1-33



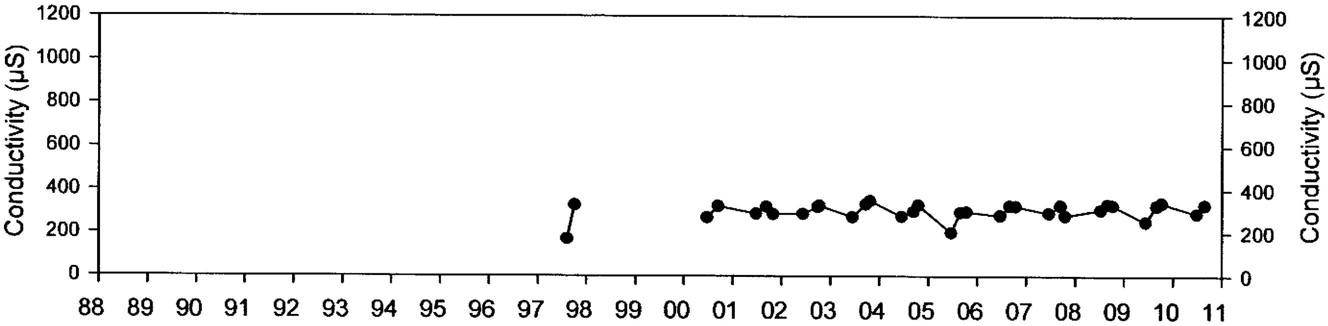
SP1-47


Conductivity (µS)
Conductivity (µs)
pH
Discharge (gpm)
PHDI Utah Region 4
88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11

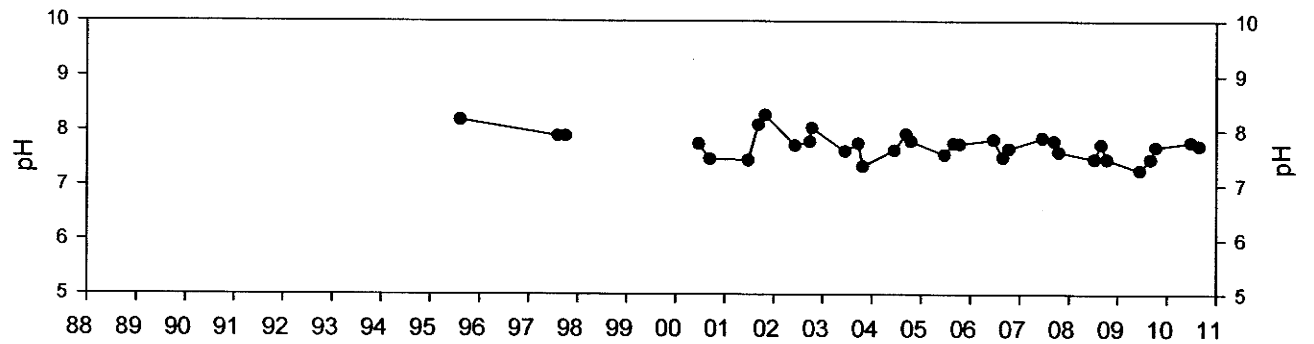
SP-18



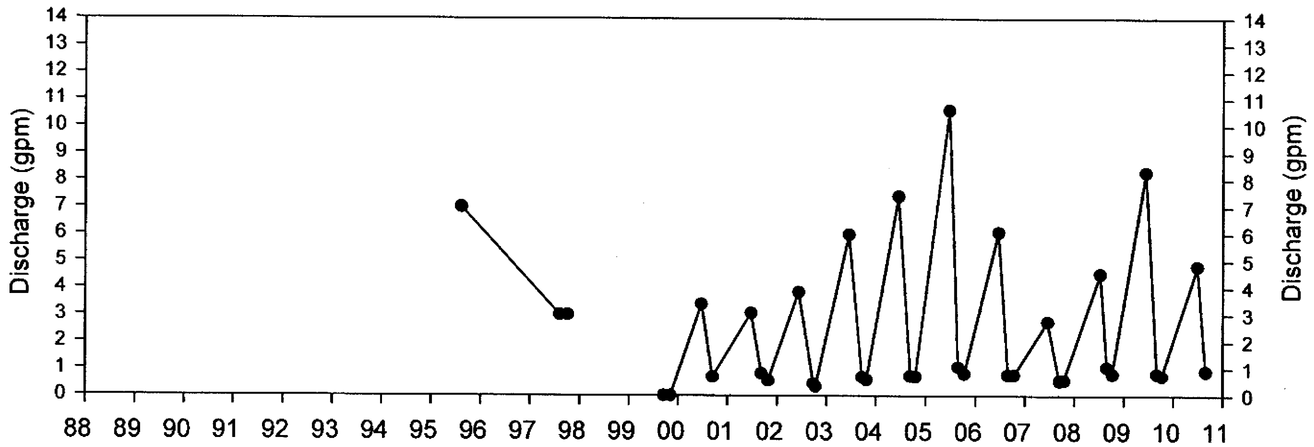
SP1-9



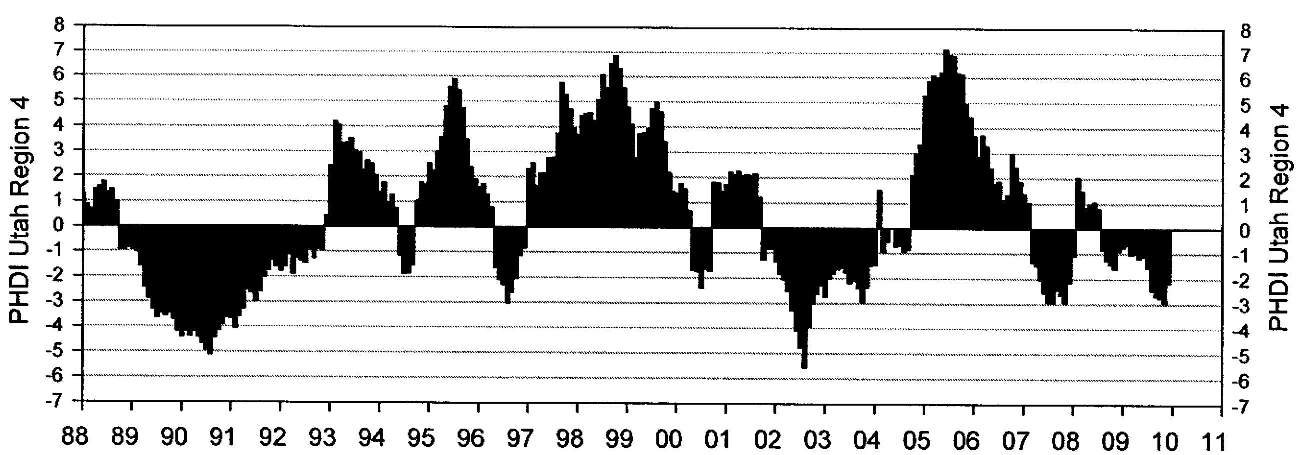
Conductivity (µS)
Conductivity (µS)
88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11



pH
pH
88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11

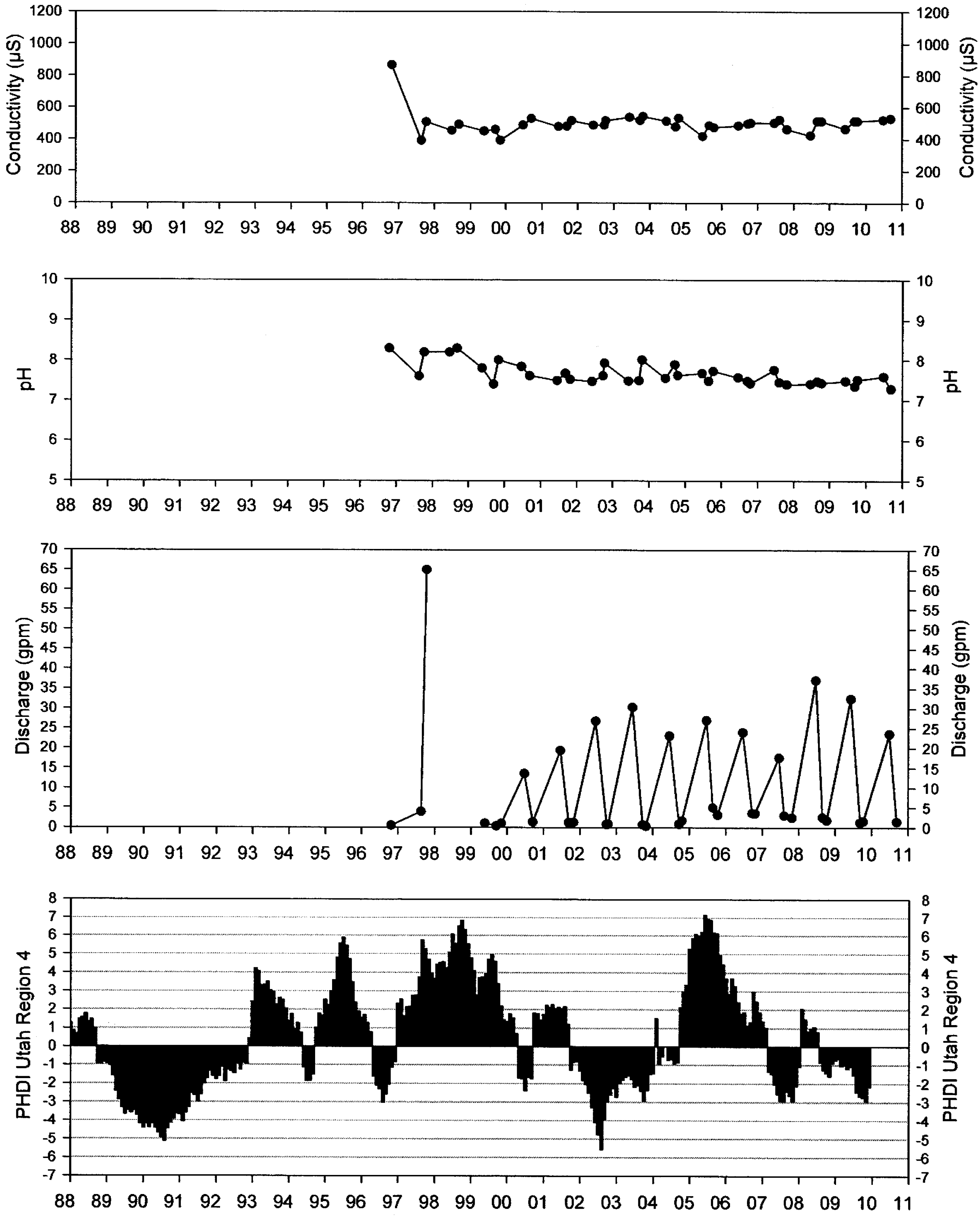


Discharge (gpm)
Discharge (gpm)
88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11



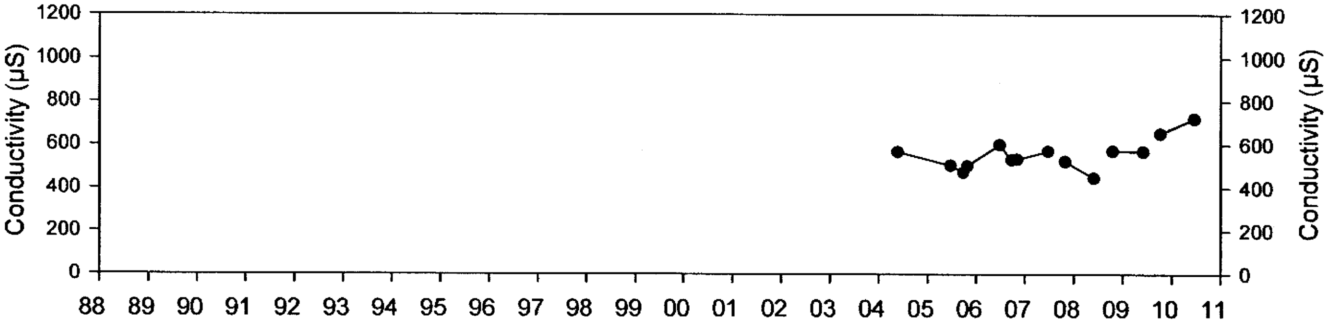
PHDI Utah Region 4
PHDI Utah Region 4
88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11

SP2-1

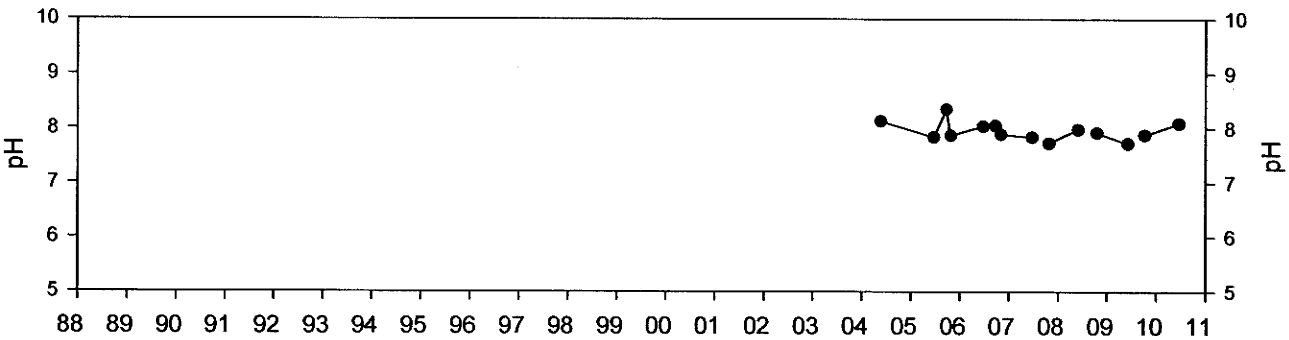


Conductivity (µS)
pH
Discharge (gpm)
PHDI Utah Region 4
88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11

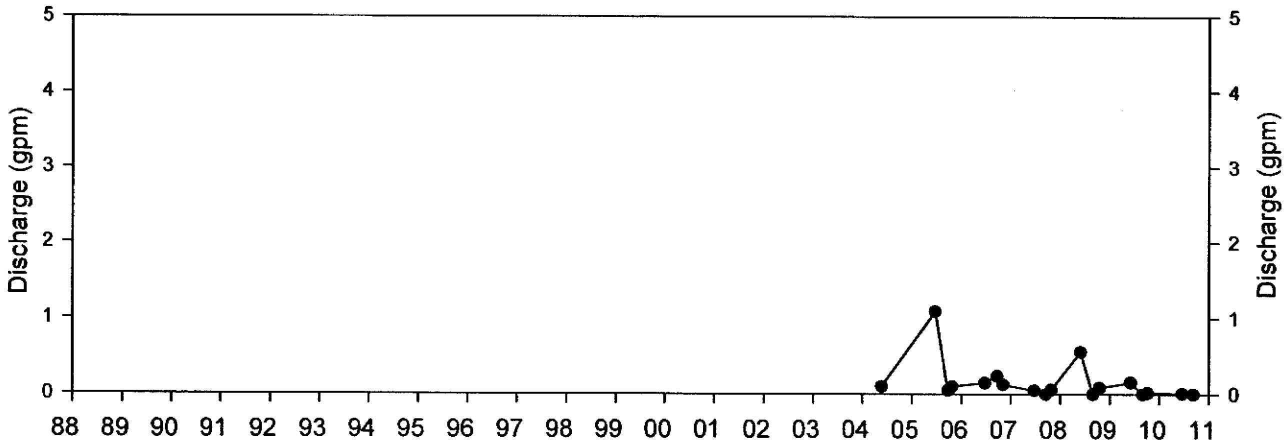
SP-22



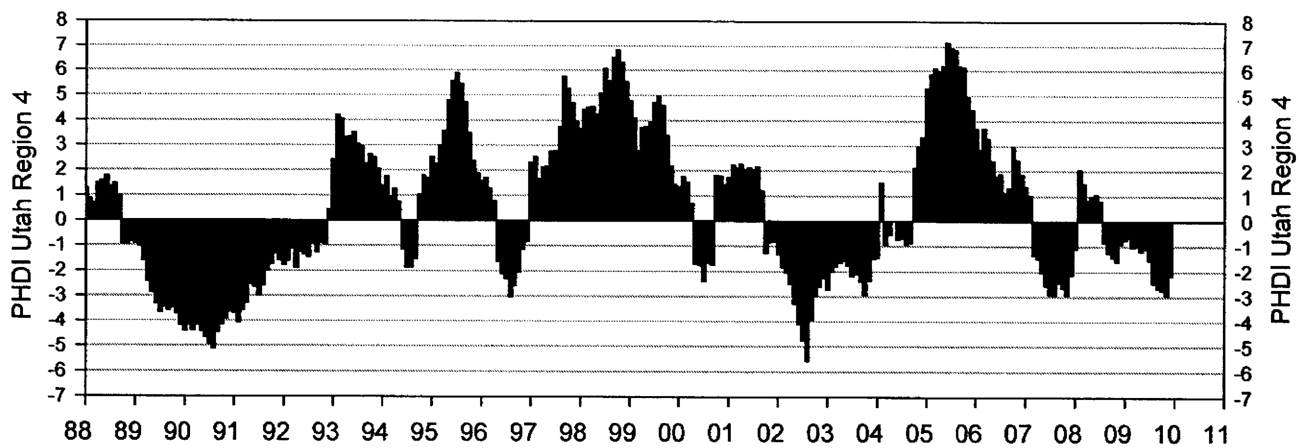
Conductivity (µS)
1200
1000
800
600
400
200
0
88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11



pH
10
9
8
7
6
5
88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11

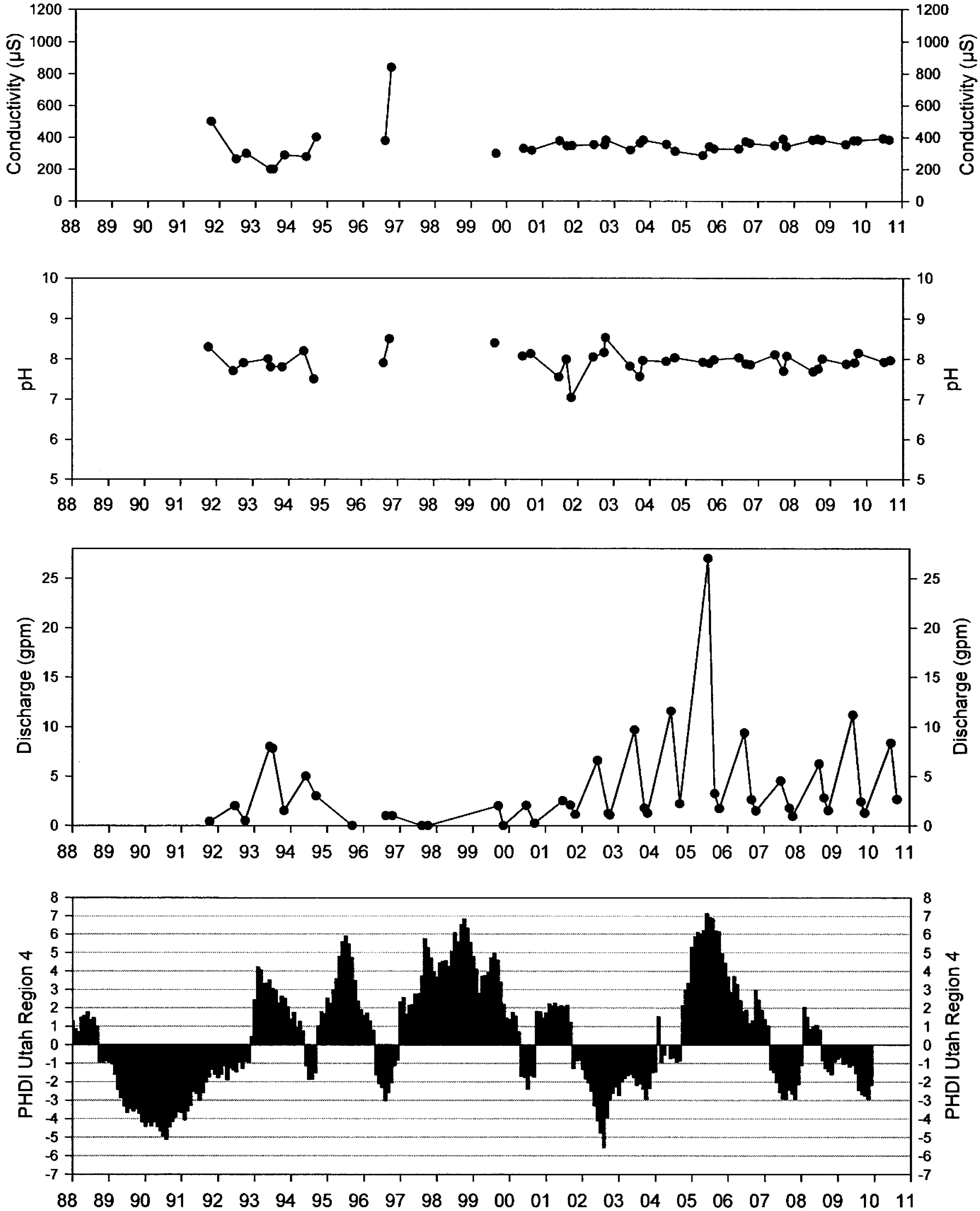


Discharge (gpm)
5
4
3
2
1
0
88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11



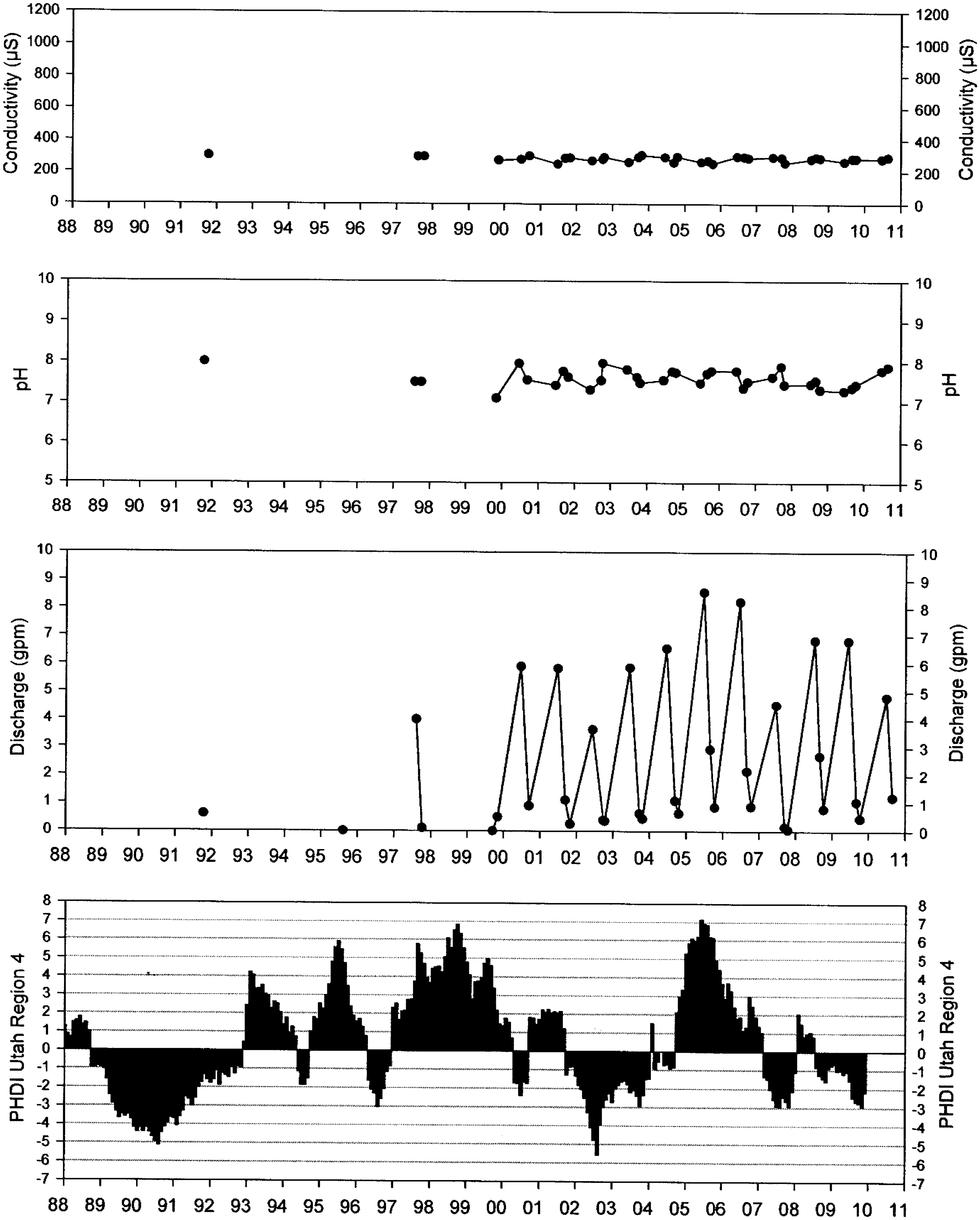
PHDI Utah Region 4
8
7
6
5
4
3
2
1
0
-1
-2
-3
-4
-5
-6
-7
88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11

SP2-24



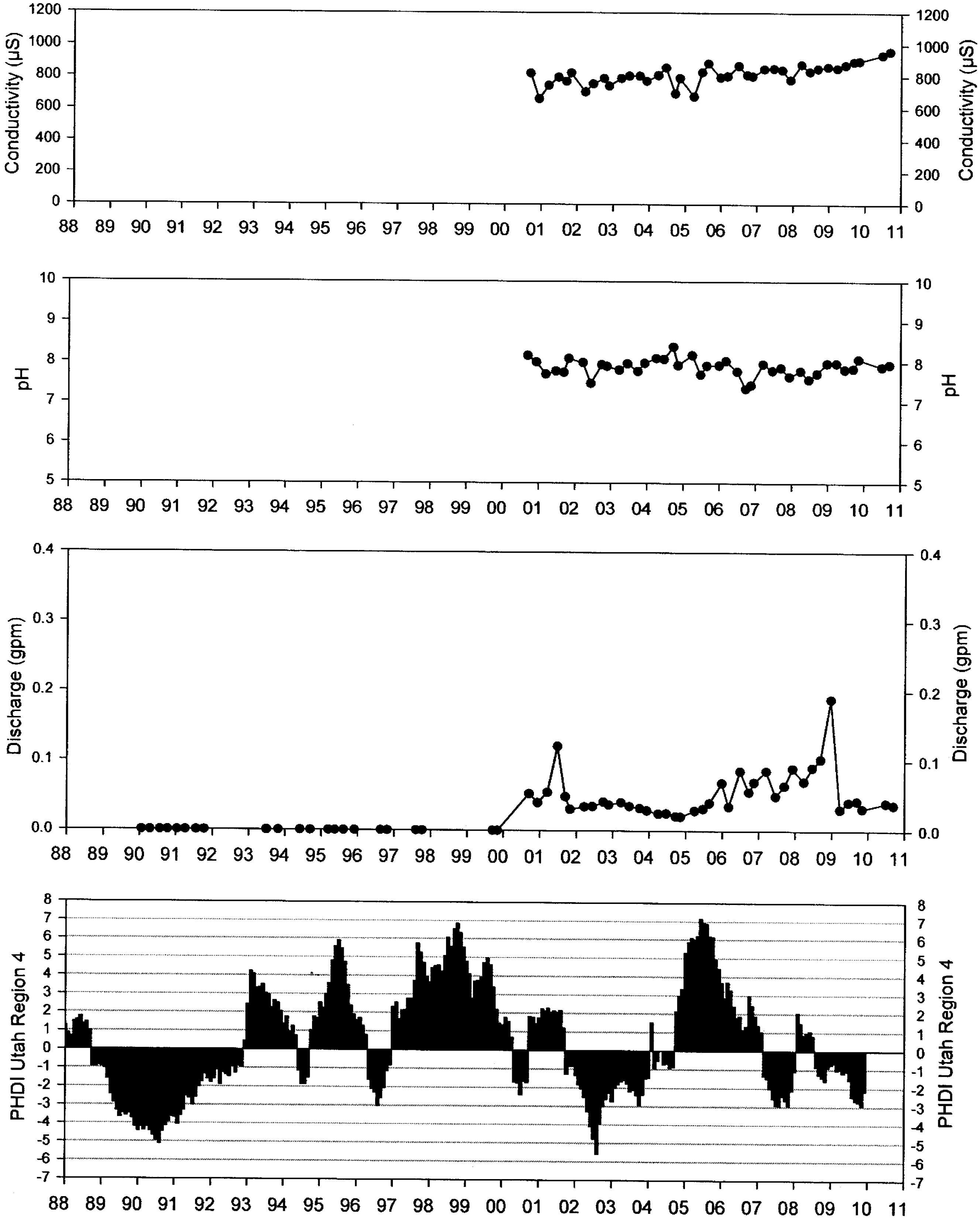
Conductivity (µS)
pH
Discharge (gpm)
PHDI Utah Region 4
88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11

SP2-9



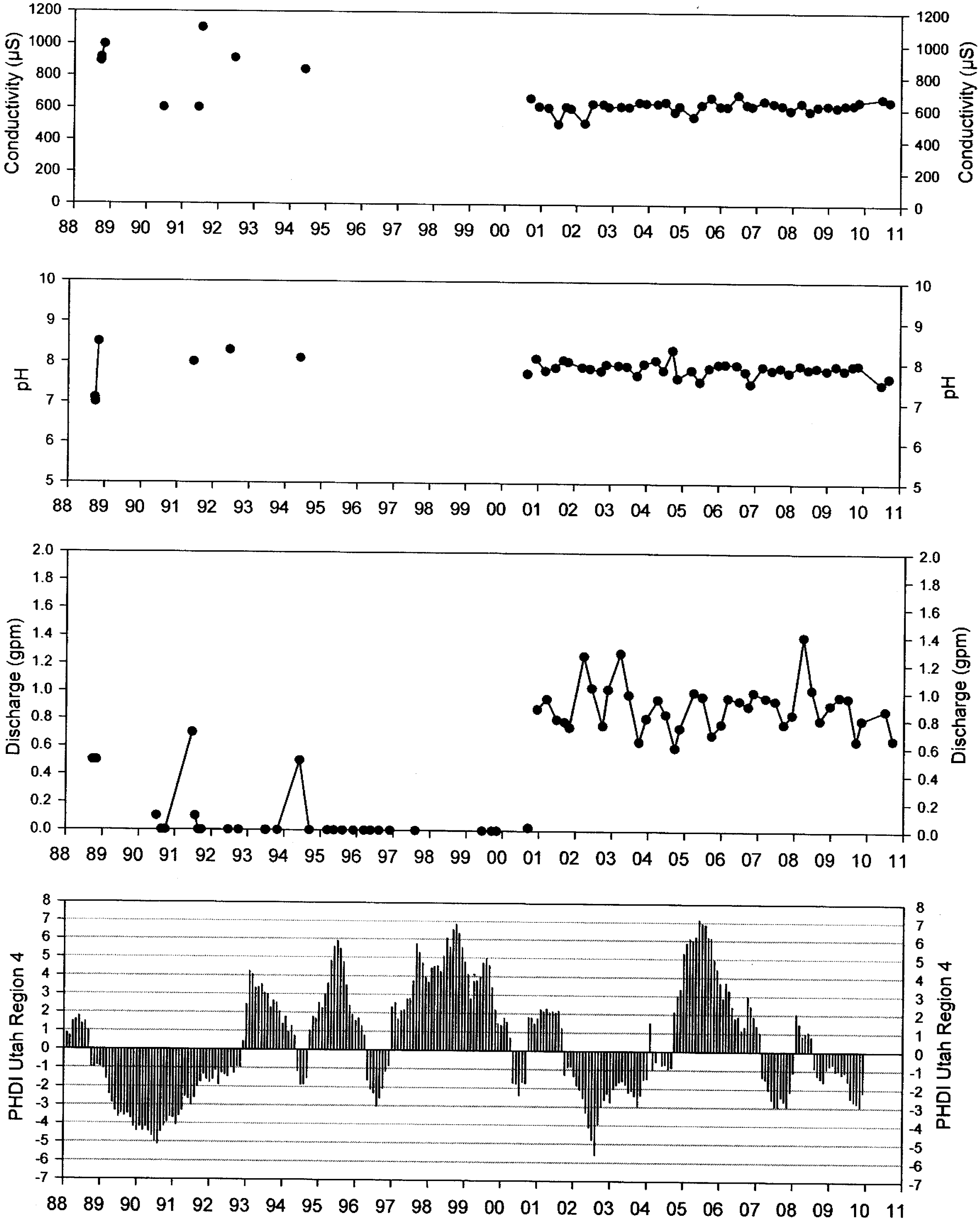
Conductivity (µS)
pH
Discharge (gpm)
PHDI Utah Region 4
88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11

SP-30



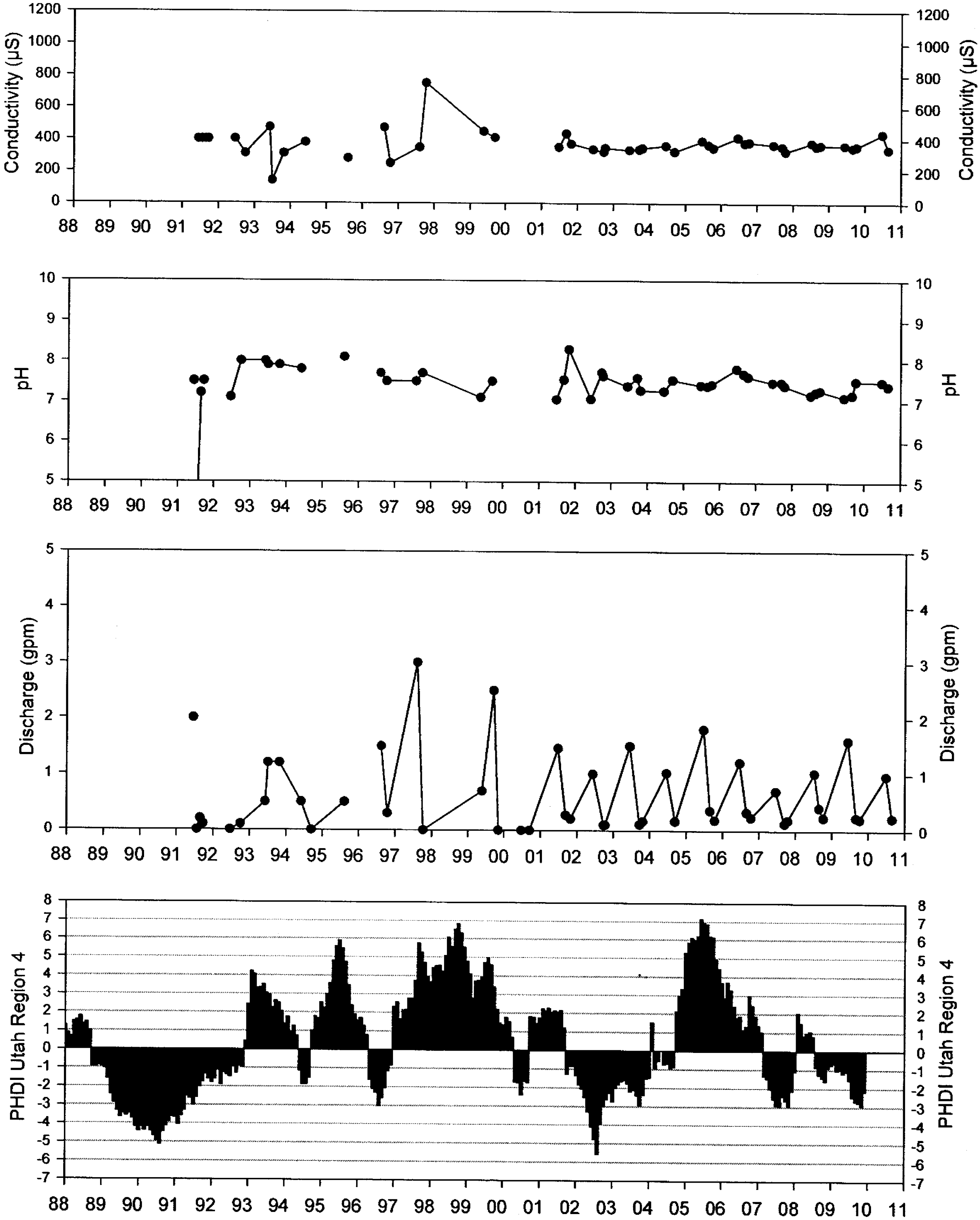
Conductivity (µS)
pH
Discharge (gpm)
PHDI Utah Region 4
88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11

SP-36



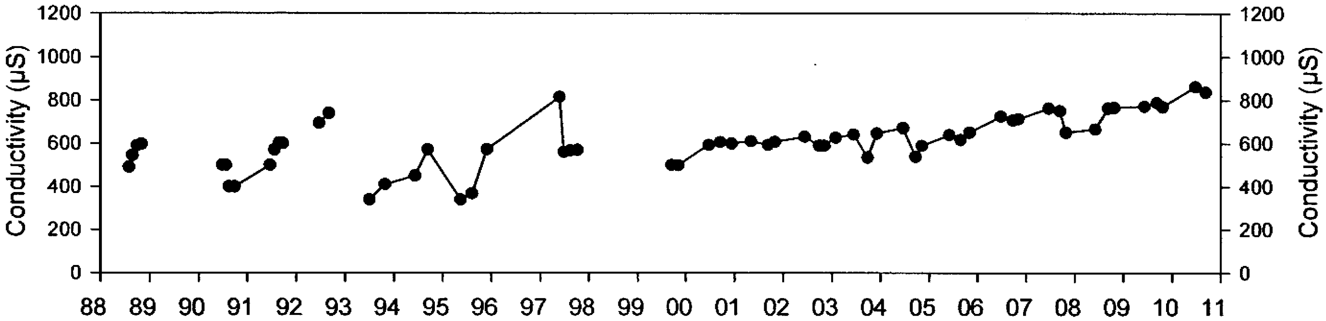
Conductivity (µS)
pH
Discharge (gpm)
PHDI Utah Region 4
88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11

SP-47A

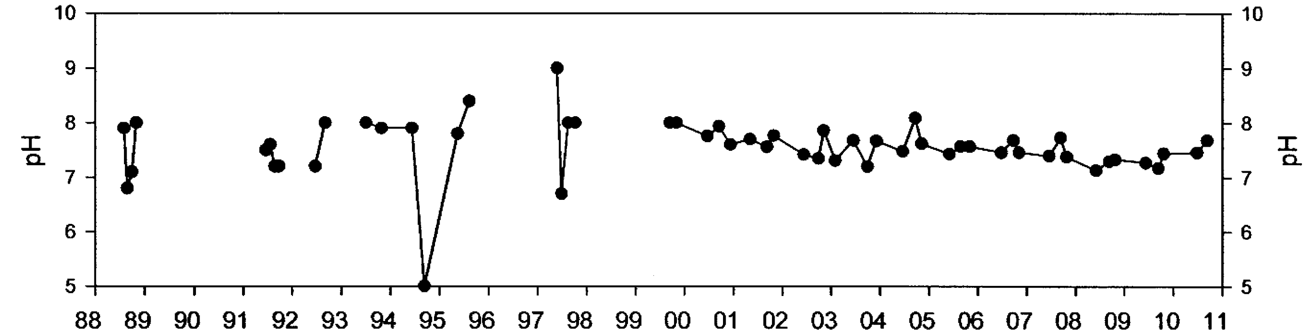


Conductivity (µS)
1200
1000
800
600
400
200
0
88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11
pH
10
9
8
7
6
5
Discharge (gpm)
5
4
3
2
1
0
PHDI Utah Region 4
8
7
6
5
4
3
2
1
0
-1
-2
-3
-4
-5
-6
-7

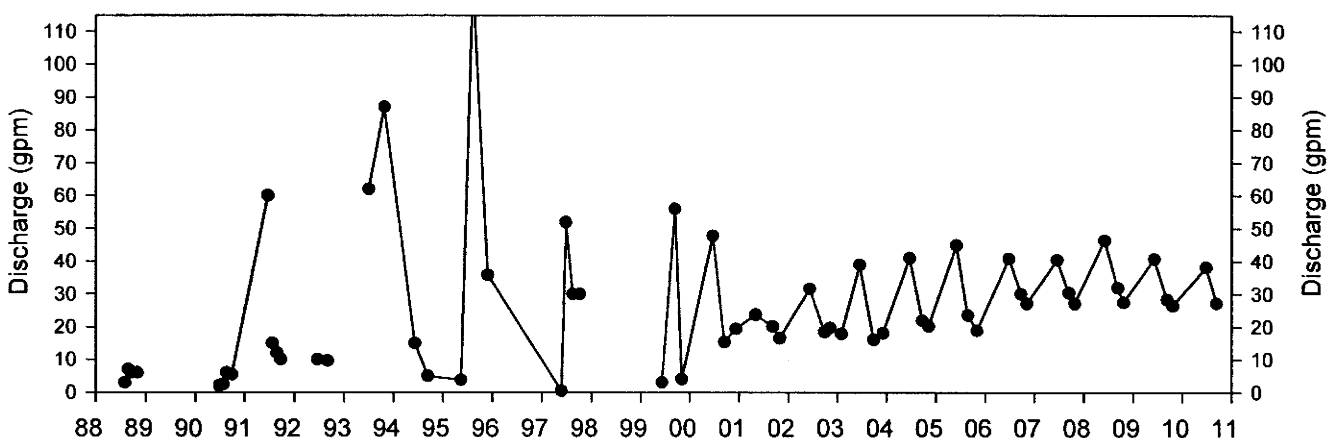
SP-58



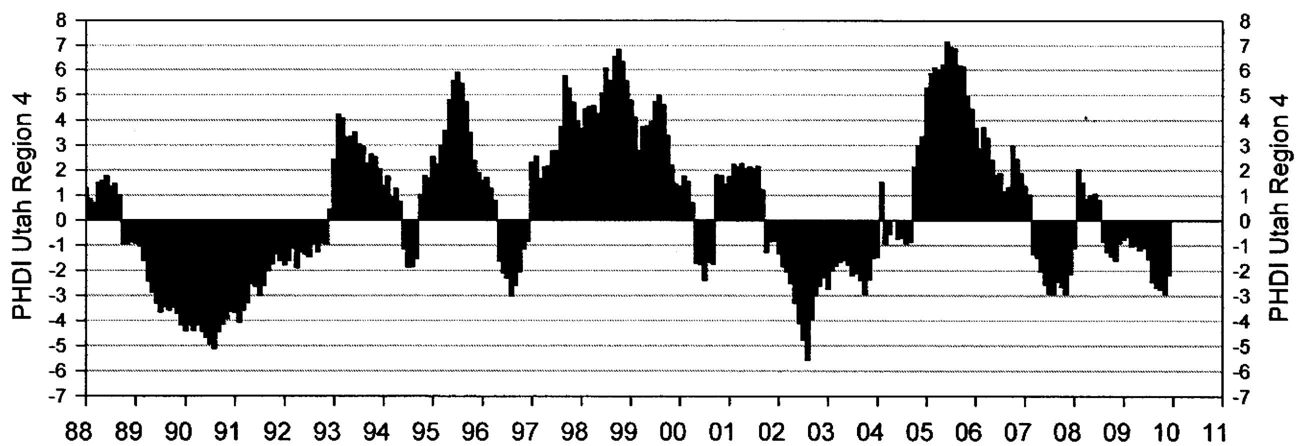
Conductivity (µS)
0
200
400
600
800
1000
1200
88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11



pH
5
6
7
8
9
10
88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11

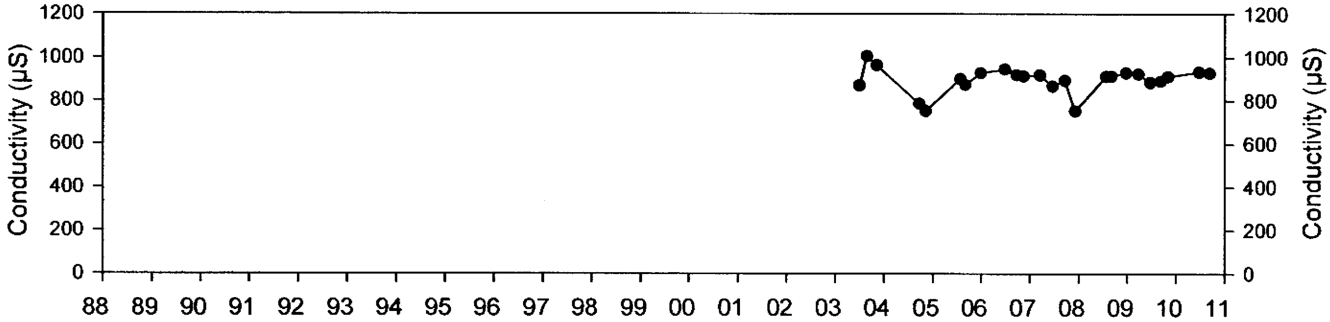


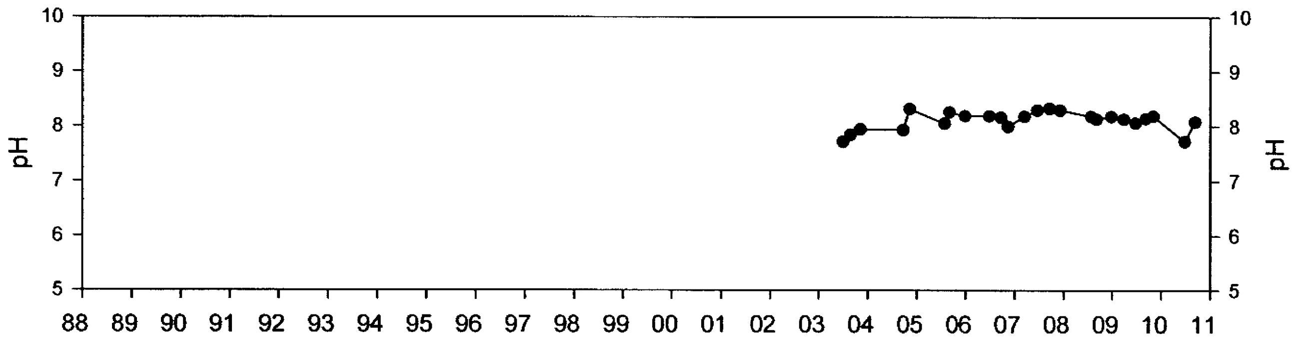
Discharge (gpm)
0
10
20
30
40
50
60
70
80
90
100
110
88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11

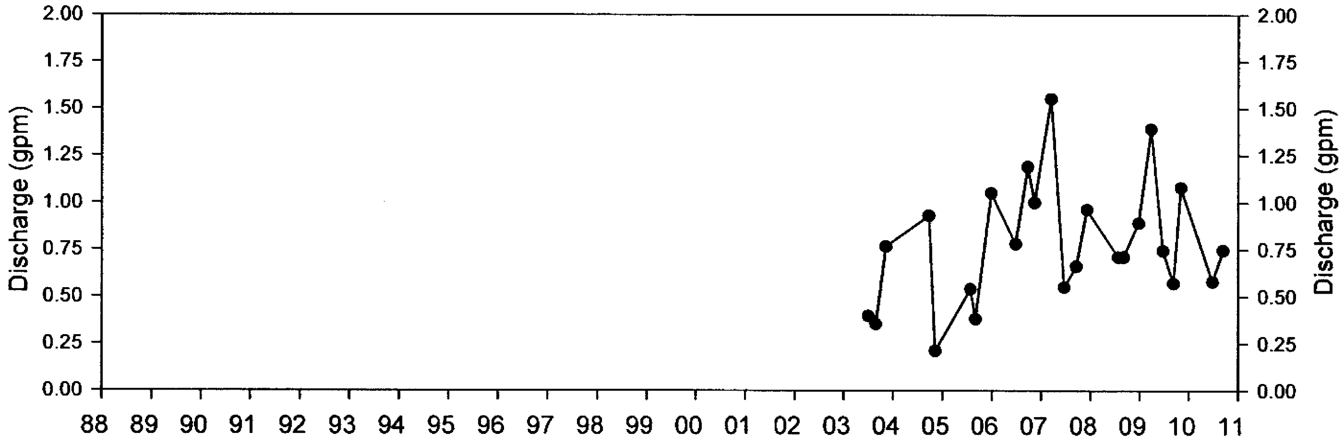


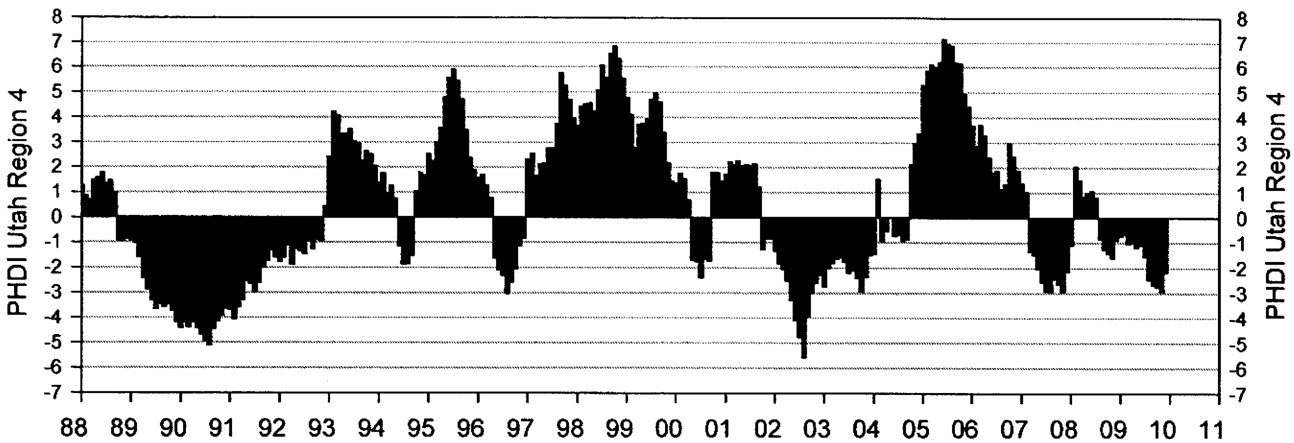
PHDI Utah Region 4
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
4
5
6
7
8
88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11

SP-79

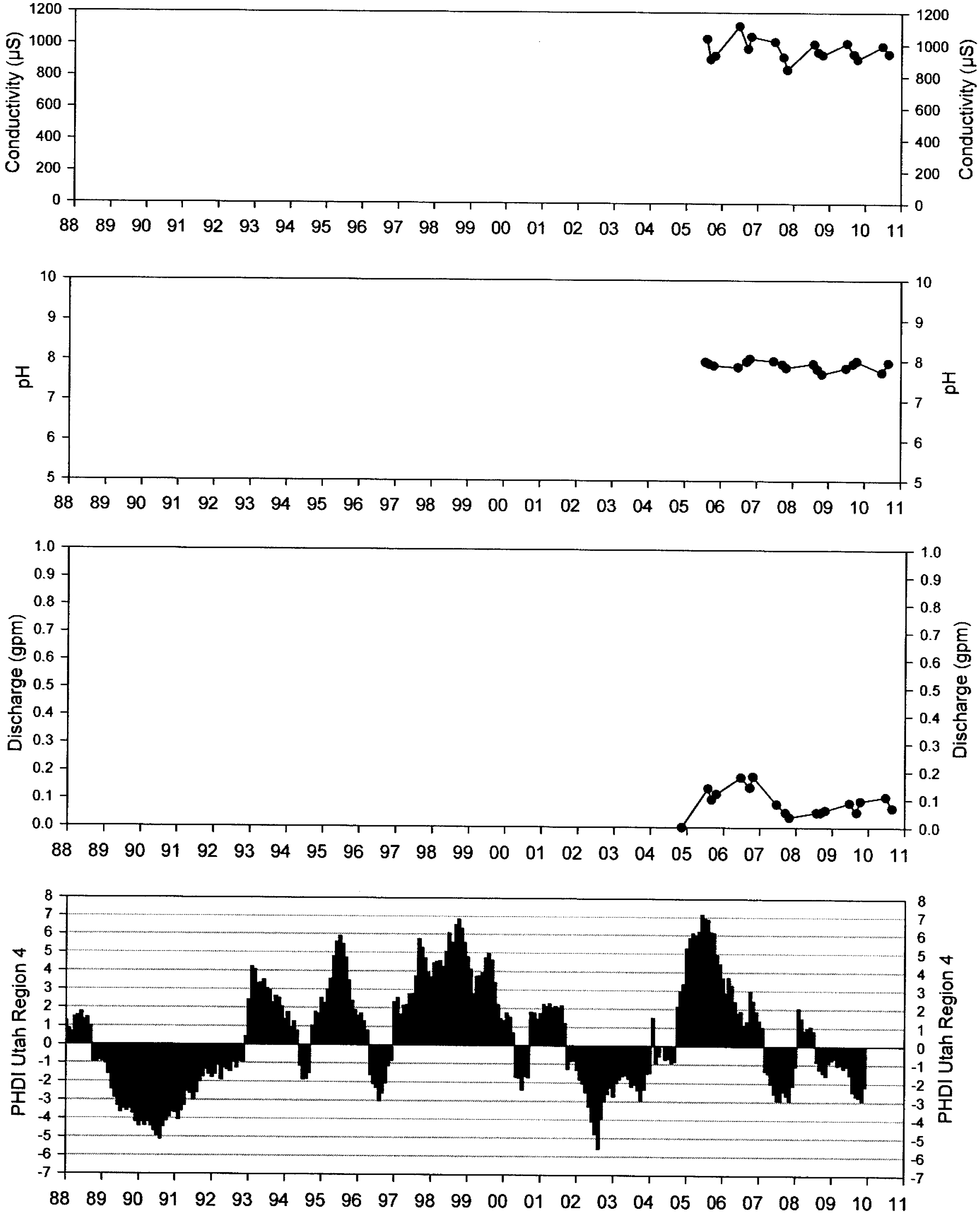

Conductivity (µS)
1200
1000
800
600
400
200
0
88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11


pH
10
9
8
7
6
5
88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11


Discharge (gpm)
2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.00
88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11

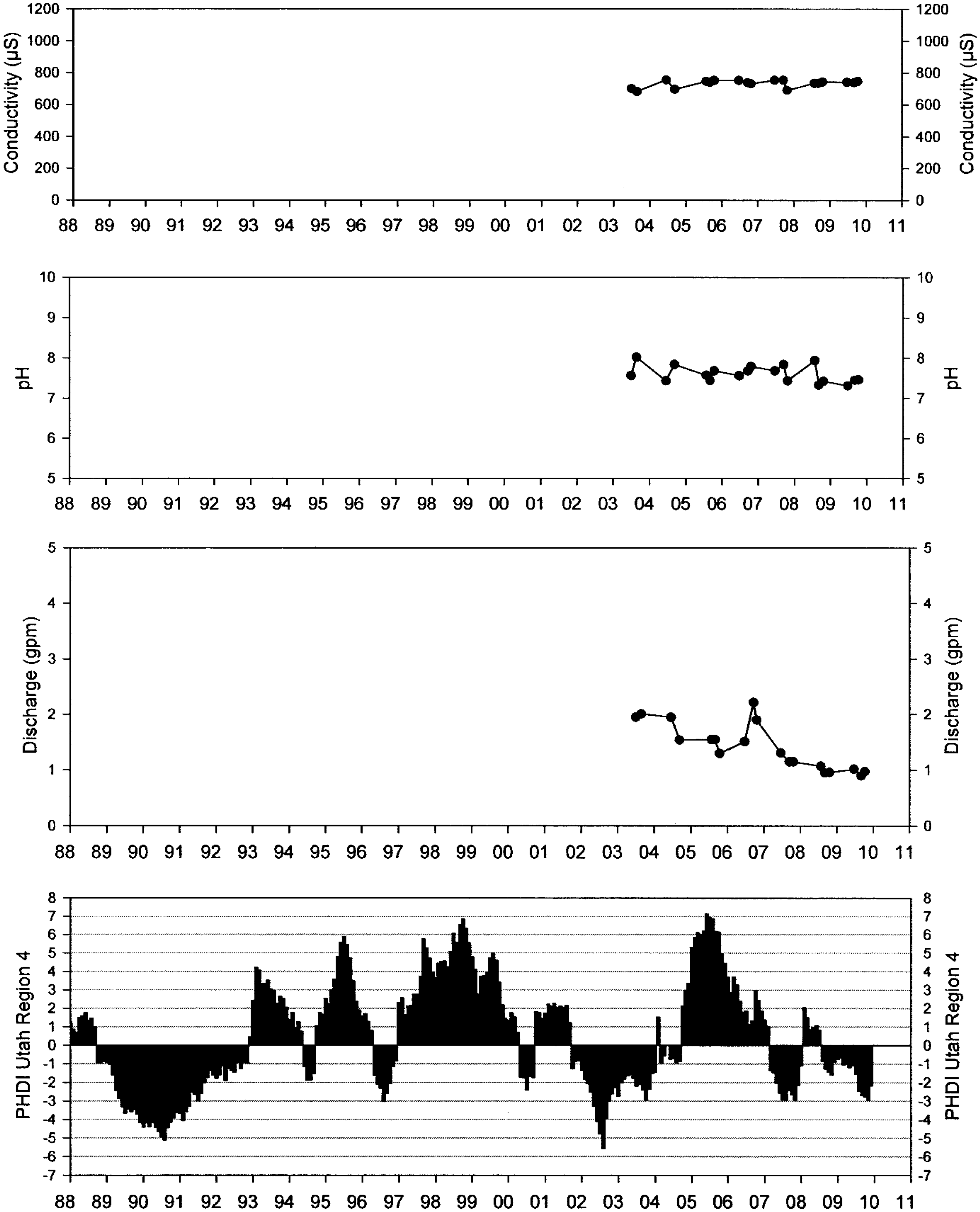

PHDI Utah Region 4
8
7
6
5
4
3
2
1
0
-1
-2
-3
-4
-5
-6
-7
88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11

LB-12



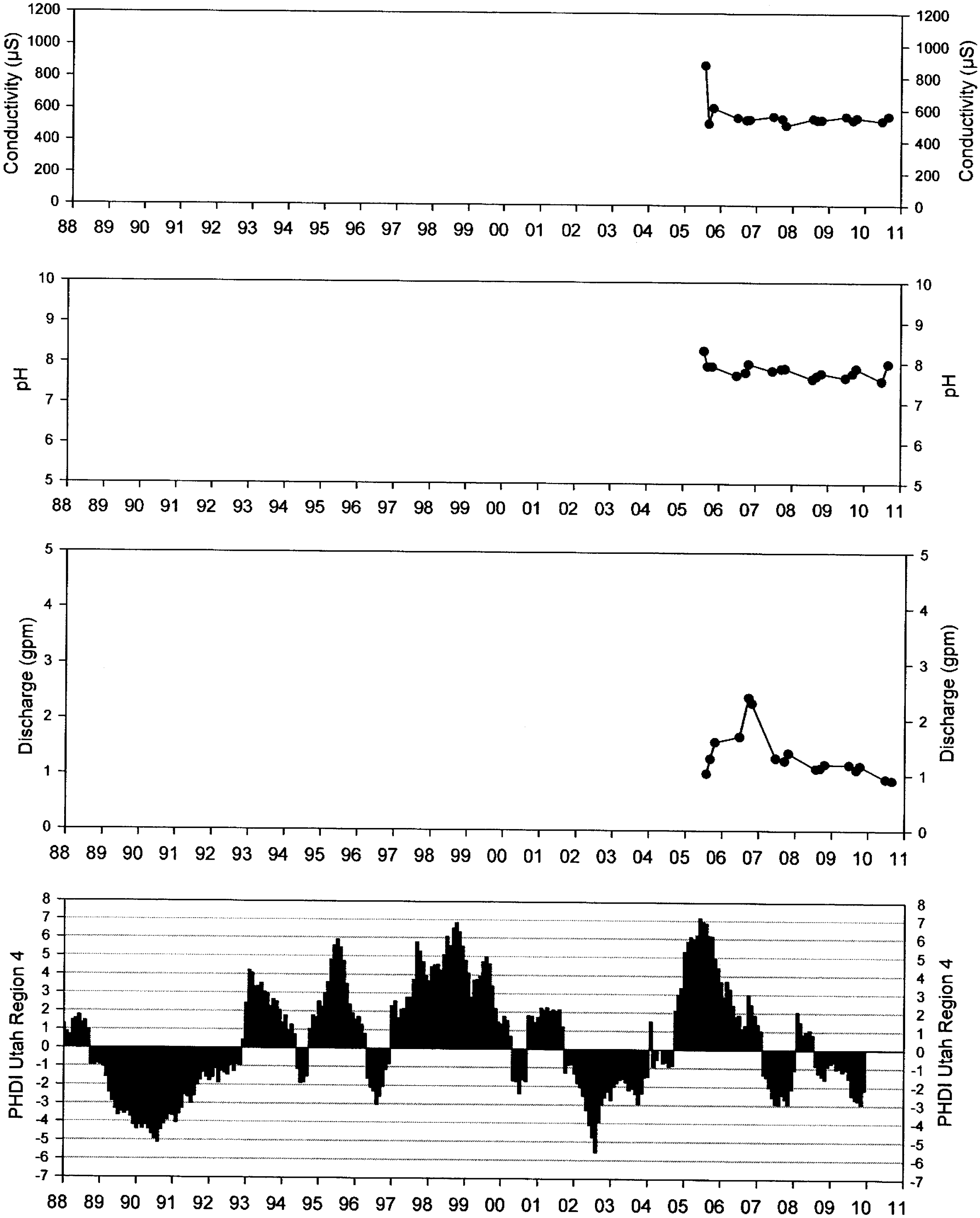
Conductivity (µS)
pH
Discharge (gpm)
PHDI Utah Region 4
88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11

LB-5A

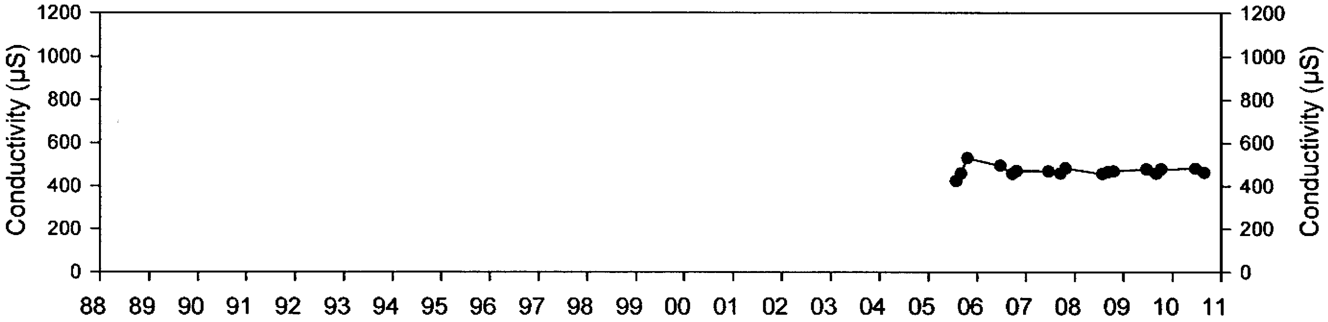


Conductivity (µS)
pH
Discharge (gpm)
PHDI Utah Region 4
88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11

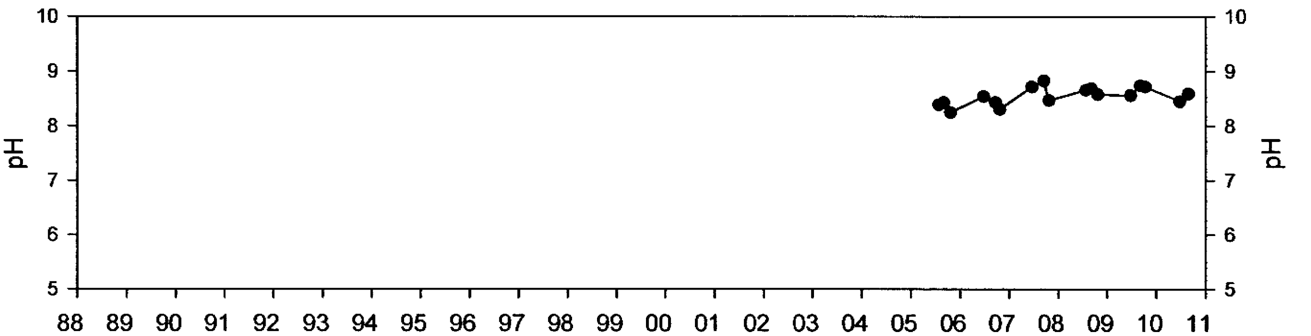
LB-7


Conductivity (µS)
pH
Discharge (gpm)
PHDI Utah Region 4
88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11

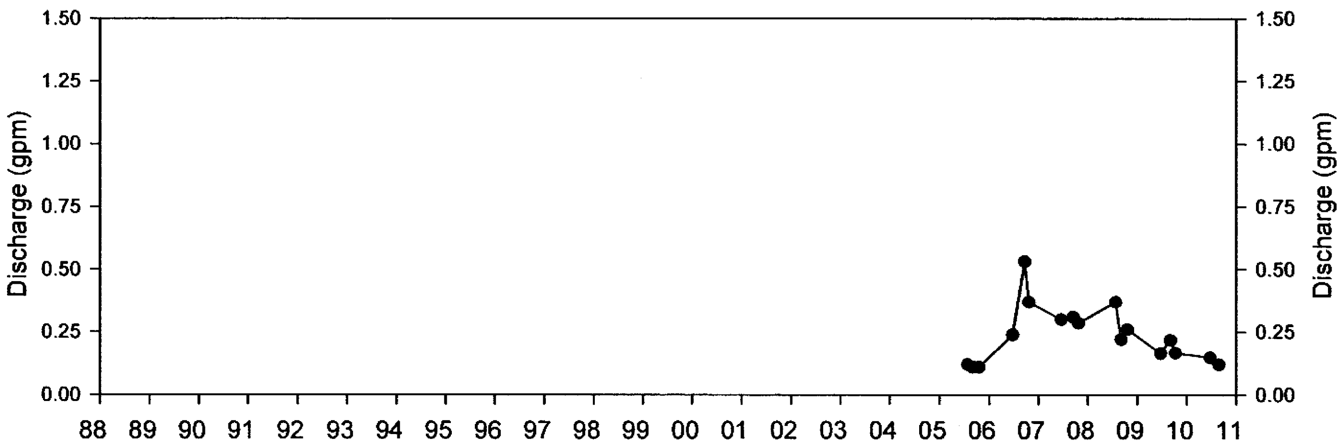
LB-7A



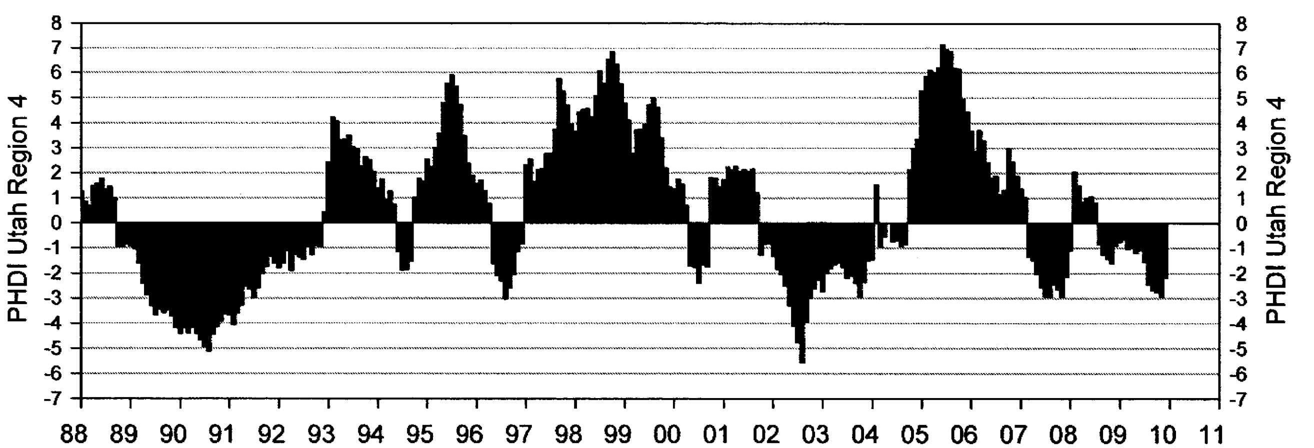
Conductivity (µS)
1200
1000
800
600
400
200
0
88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11



pH
10
9
8
7
6
5
88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11

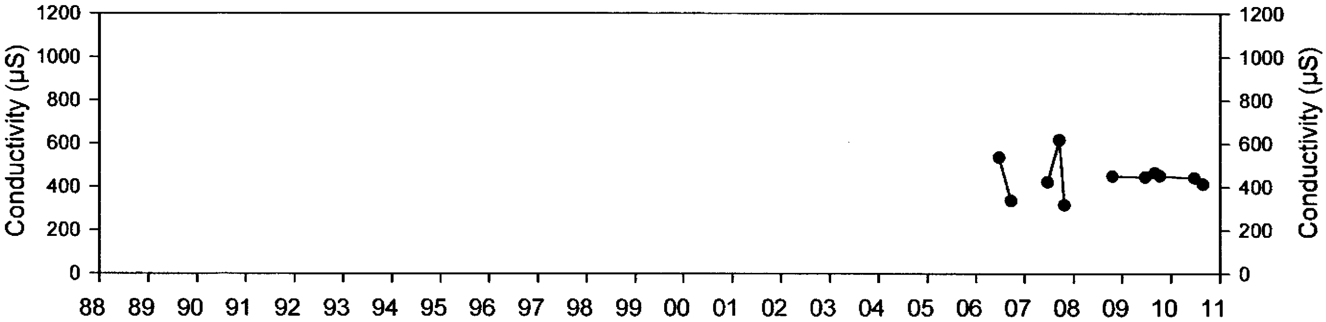


Discharge (gpm)
1.50
1.25
1.00
0.75
0.50
0.25
0.00
88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11

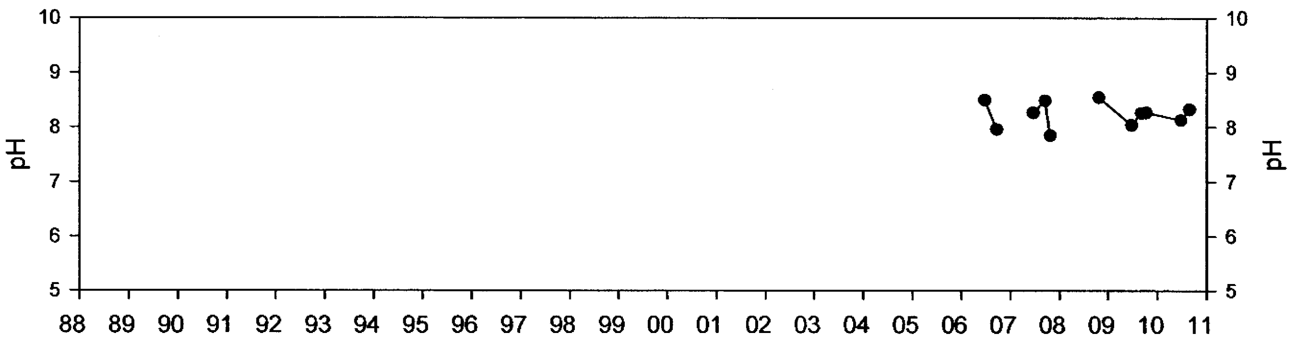


PHDI Utah Region 4
8
7
6
5
4
3
2
1
0
-1
-2
-3
-4
-5
-6
-7
88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11

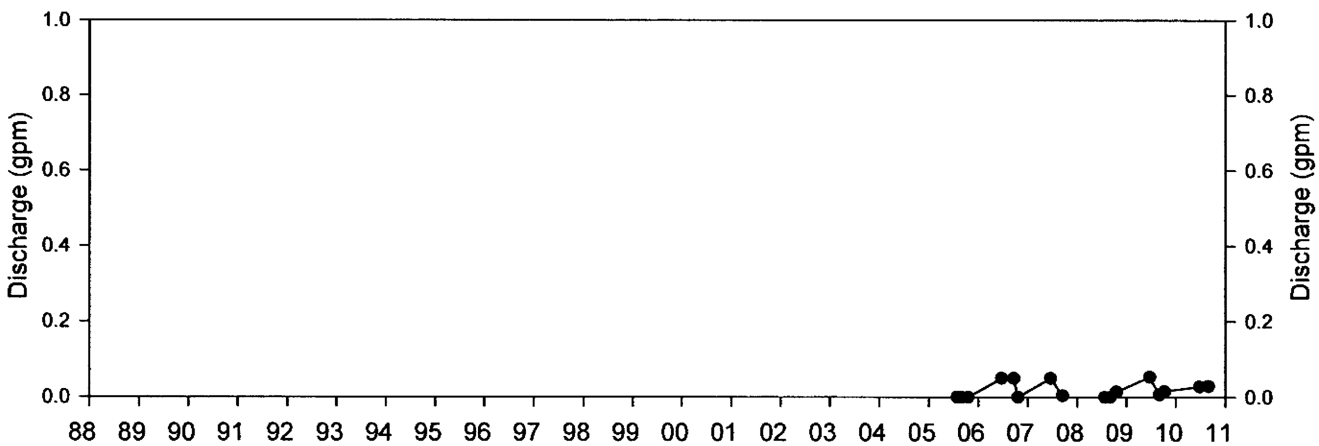
LB-7B



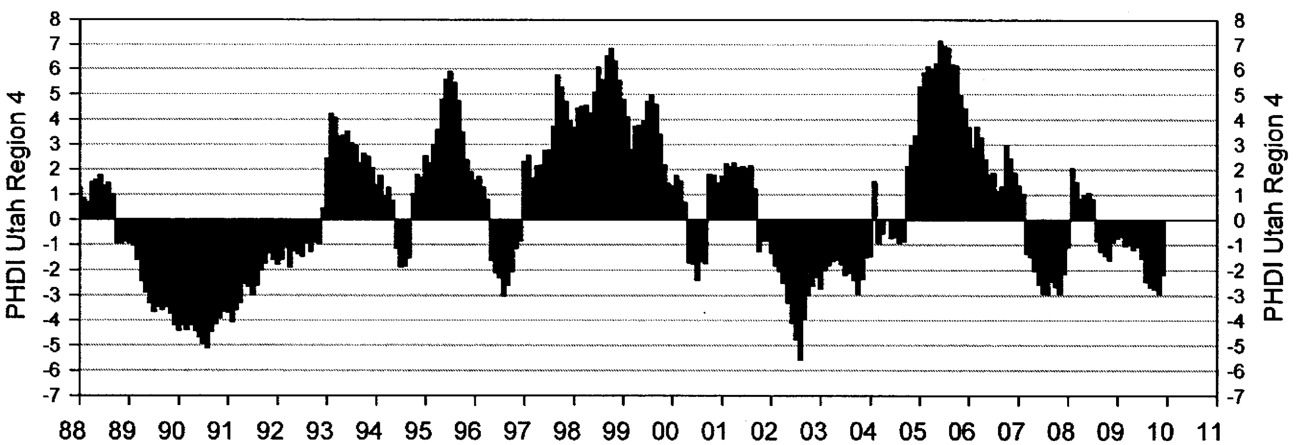
Conductivity (µS)
0
200
400
600
800
1000
1200
88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11



pH
5
6
7
8
9
10
88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11

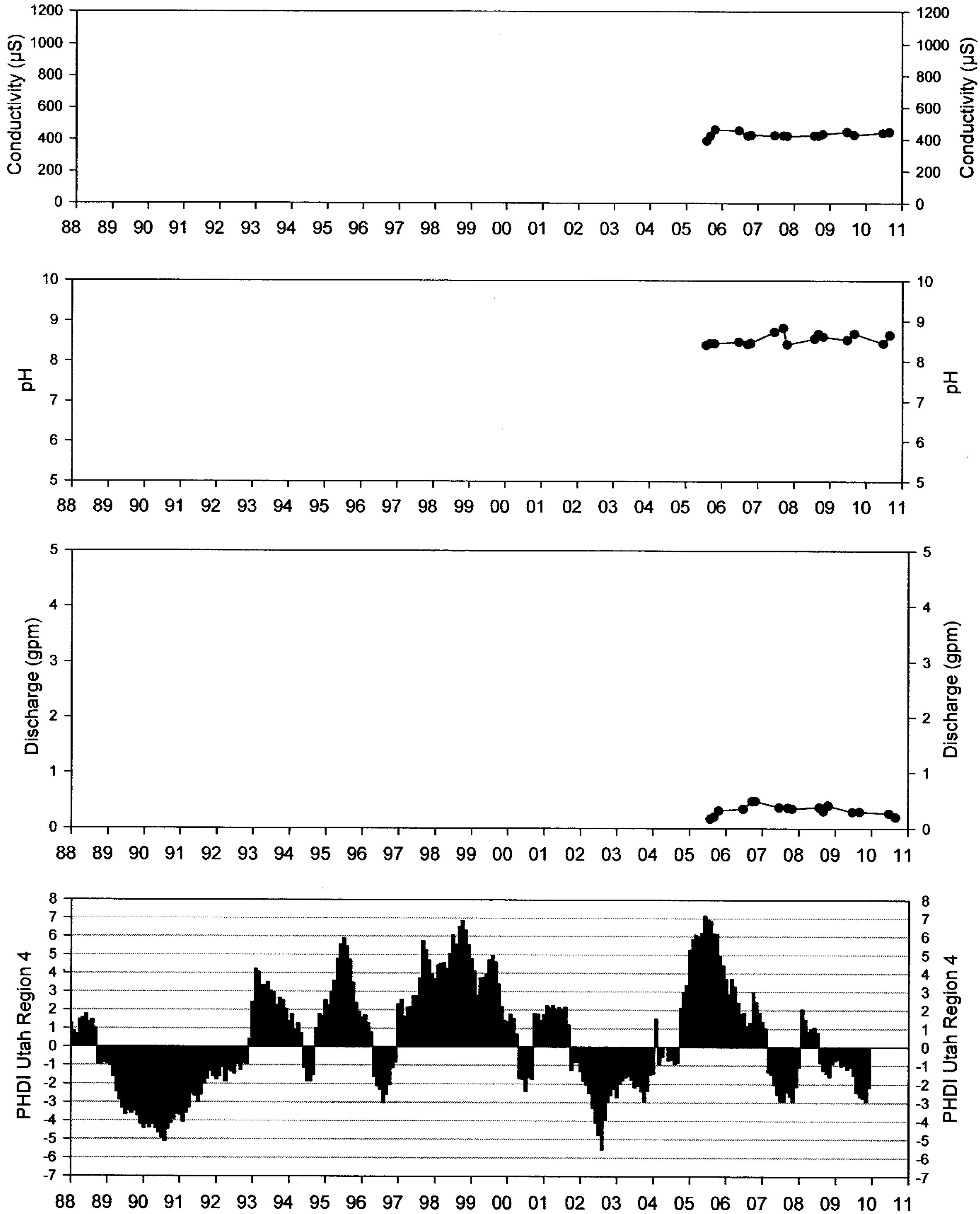


Discharge (gpm)
0.0
0.2
0.4
0.6
0.8
1.0
88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11



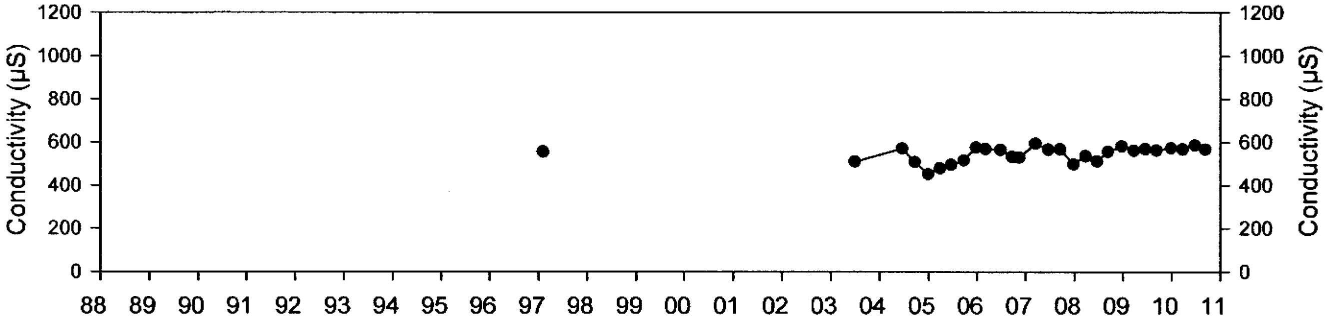
PHDI Utah Region 4
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
4
5
6
7
8
88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11

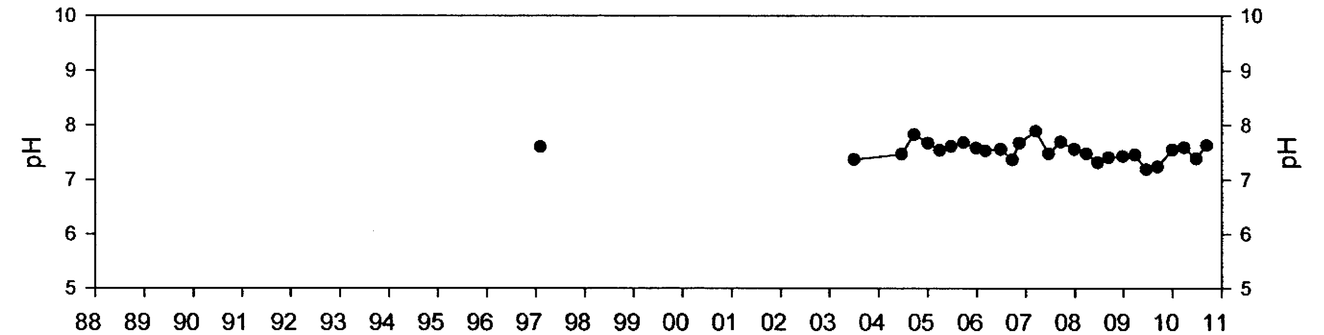
LB-7C

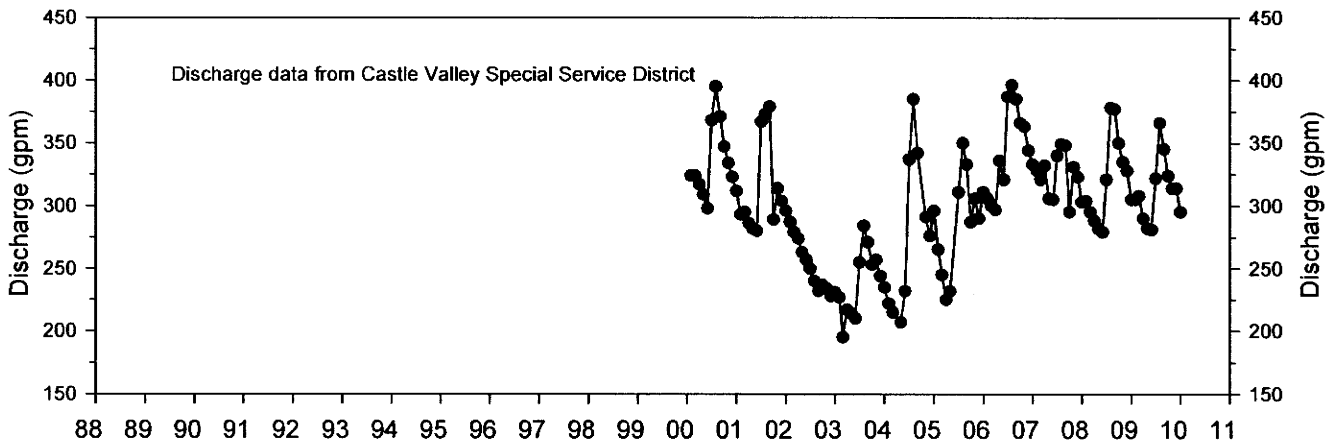


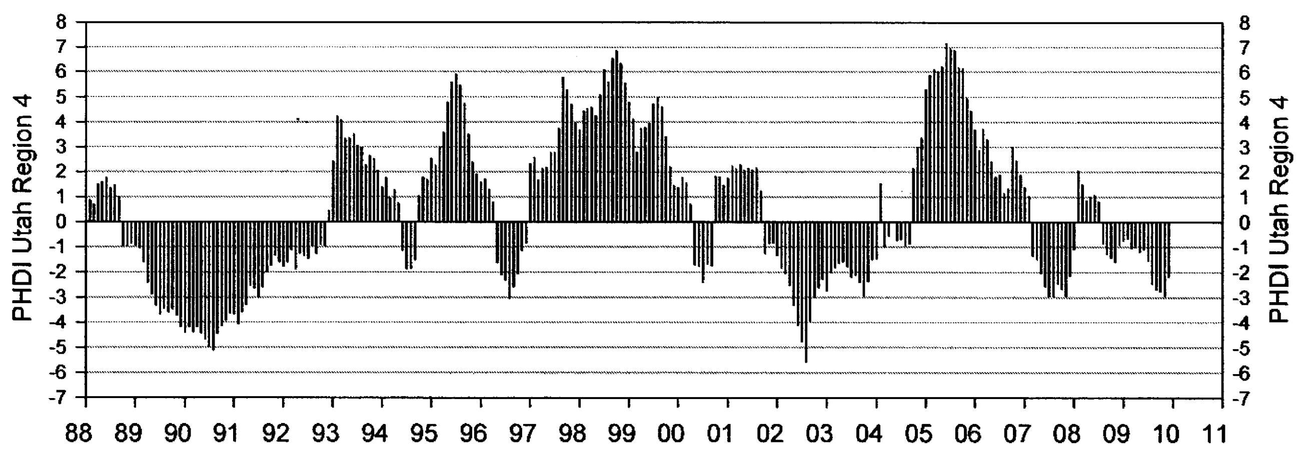
Conductivity (µS)
pH
Discharge (gpm)
PHDI Utah Region 4
88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11

Little Bear Spring

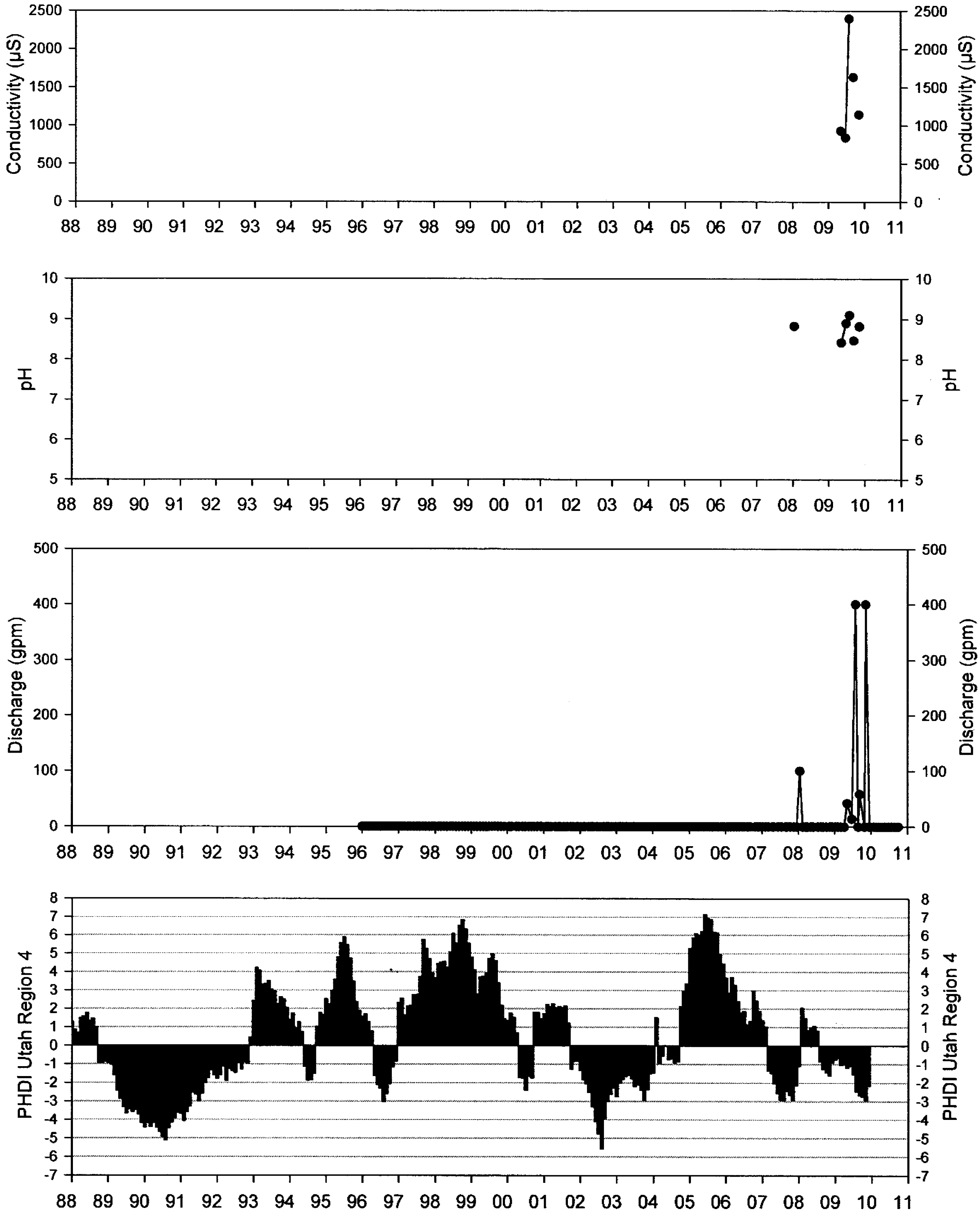






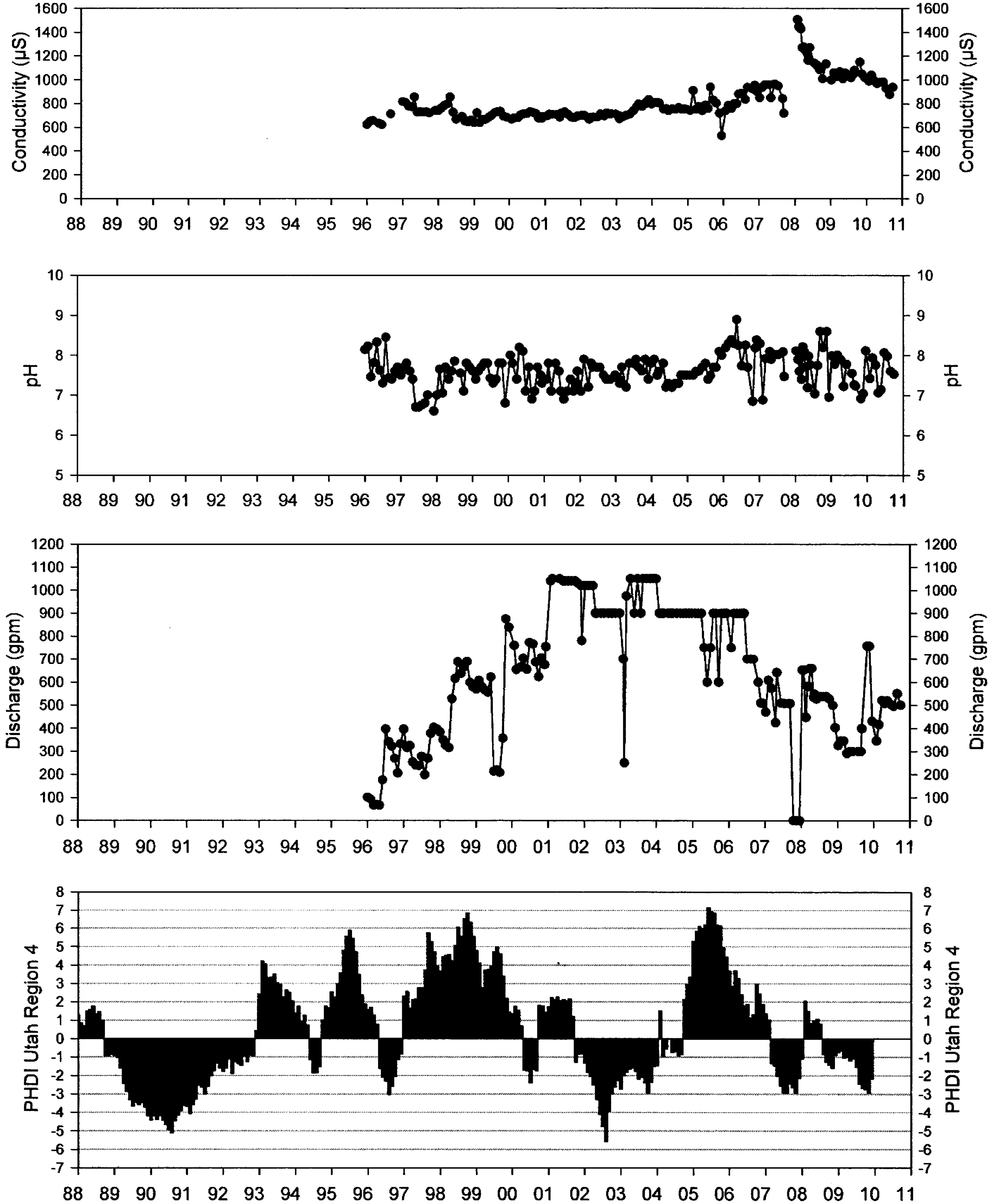


UPDES 001



Conductivity (µS)
2500
2000
1500
1000
500
0
88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11
pH
10
9
8
7
6
5
Discharge (gpm)
500
400
300
200
100
0
PHDI Utah Region 4
8
7
6
5
4
3
2
1
0
-1
-2
-3
-4
-5
-6
-7

UPDES 002


Conductivity (µS)
pH
Discharge (gpm)
PHDI Utah Region 4
88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11

APPENDIX 7-15

PROBABLE HYDROLOGIC

CONSEQUENCES DETERMINATION

R645-301-728 Probable Hydrologic Consequences Determination

This document has been prepared in accordance with requirements of the State of Utah R645 Coal Mining Rules. The format follows the regulations R645-301-718.100 through R645-301-728.400. This Probable Hydrologic Consequences evaluation of the coal mining and reclamation operations has been prepared by Genwal Resources, Inc. to provide a description of the potential impacts of the mining operation on the hydrologic systems and the means to prevent or mitigate those identified impacts.

R645-301-728.100 Determination

This determination section presents a brief summary of the surface water, groundwater, and geologic resource descriptions of the permit area and the South Crandall Lease area and the U-68082 lease mod area and a description of the possible impacts of the coal mine on the hydrologic resources.

The geologic and hydrologic data and their associated appendices are contained in Chapter 6 and Chapter 7, respectively. The potential sources of contamination to the hydrologic resources in the area of the mine were identified through site visits, knowledge of the working operations of the mine and discussions with Genwal Resources personnel. These potential contamination sources and impacts include:

Water Quantity
- Interception of groundwater and surface water
- Water consumption within the mine
- Seepage from mine sumps
- Pumping from Crandall Creek

Water Quality
- Additional sediment contribution
- Fugitive dust
- Oil and grease
- Mine water discharge
- Acid-toxic materials
- Flooding or Streamflow Alteration

Each of these potential sources of contamination or impact and their associated mitigating measures or circumstances are discussed in the following sections.

Water Quantity Impacts

Possible impacts to the surface and groundwater systems from the mining operation could affect the quantity of water in the mine area. Interception, consumption, and seepage of surface or groundwater are possible mechanisms which could affect the water systems.

Interception.

A limited potential exists for interception of groundwater or surface water due to subsidence which may affect the perched aquifers (springs and seeps), and stream flows in Crandall Canyon, Blind Canyon, Horse Creek, the upper headwaters of the Indian Creek drainage (Upper Joes Valley), and the streams and springs of the South Crandall Lease area and the U-68082 lease mod area. The potential for hydrologic impacts may result from creating subsurface interconnections from the more permeable zones in the strata as a result of mine subsidence. This can be expressed by the potential interrelated occurrences of intercepted groundwater flow in the overlying perched aquifers, the interruption or lessening of flow to springs, or the interception of surface water flow from ephemeral streams.

Groundwater Interception.

Typically, groundwater interception and translocation of that water is the primary mechanism by which the groundwater system may be impacted. As indicated in Section 7.24.1 of this permit, the regional groundwater system, located in the Blackhawk-Starpoint aquifer at the Crandall Canyon Mine, is below the Hiawatha Coal in all but the western portion of the mine.

Monitoring of in-mine and surface wells indicate that the potentiometric surface of the regional Blackhawk-Star Point aquifer in the mine area lies approximately 50 to 60 feet below the top of the Star Point Sandstone over most of the mine. In the westernmost portion of the mine, near the Joes Valley Fault system, the potentiometric surface of the Star Point Sandstone is at or slightly above the elevation of the floor of the mine. In these areas, minor amounts of groundwater weep from the floor of the mine. In the remainder of the mining areas, because mining is being conducted in the Hiawatha seam of the Blackhawk Formation, which overlies the Starpoint Sandstone, dewatering of the Blackhawk-Starpoint aquifer by the Crandall Canyon Mine is not possible.

Historically, the springs within the permit area which are monitored on a quarterly basis, in the perched aquifer of the Blackhawk Formation above the mine, have not been affected by operating the Crandall Canyon Mine. ~~Because of the tightness of the joints and the presence of aquicludes, significant mine in-flows from the overlying strata have not occurred and nor are they anticipated.~~ Locally, modest amounts of groundwater have been intercepted during mining operations at the Crandall Canyon Mine. Prior to 1996, discharge from the Crandall Canyon Mine was minimal or did not occur. As mining occurred in the northwest portion of the mine in Sections 26 and 35, T15S, R6E, appreciable groundwater inflows were encountered. Most of this groundwater entered the mine workings from fracture zones in the mine roof. This groundwater discharge appeared to be associated with release of groundwater from storage in fractured paleochannel systems overlying the Hiawatha coal seam. The fracture systems from which the groundwater emanated are likely associated with synthetic faulting related to the Joes Valley Fault system. The Joes Valley Fault system, which extends considerable distances to both the north and south, is present immediately west of mined areas.

The amount of groundwater flowing into the mine from Sections 26 and 35, T15S, R6E, together with groundwater originating from less significant sources located elsewhere in the mine, exceeded the amount of groundwater utilized in underground mining processes.

Consequently, it became necessary to discharge the excess groundwater from the Crandall Canyon Mine. The mine water was pumped from underground sumps to the surface and then discharged into Crandall Canyon Creek at monitoring point UPDES 002. The northwest portion of the Crandall Canyon Mine was sealed after mining in that area was complete. However, drainage of groundwater from the sealed northwest portion of the mine continued. Groundwater discharge from the Crandall Canyon Mine was essentially continuous throughout the remaining period of active mining.

In August 2007, a tragic mine collapse event occurred at the Crandall Canyon Mine. As a consequence of this event, the Crandall Canyon Mine was subsequently closed and sealed. Accordingly, as the mine pumps were removed, it was no longer possible to pump groundwater from the Crandall Canyon Mine workings and discharge from the mine ceased during September 2007.

Beginning in January 2008, groundwater began to discharge from the Crandall Canyon Mine portals via gravity drainage. It should be noted that, based on the geometry of the Crandall Canyon Mine workings (with the lowest elevation regions occurring in the southern part of the mine), large portions of the mine workings likely remain free of mine water.

A reconnaissance of field information and data available from the old Huntington #4 permit indicates that Little Bear Spring located in T16S-R7E-Sec9 (see Plates 7-12, 7-13, and 7-14) emanates from the Panther (lowest member) of the Star Point Formation. Previous drilling within the mine area has shown that the three members of the Starpoint Sandstone are vertically isolated from one another. The Spring Canyon member is located within the upper 100 feet of the Starpoint Sandstone. This member has been found to contain water in some areas of the mine. The Storrs member was isolated from the Spring Canyon member by interbedded shale and siltstone. It did not appear to contain any appreciable water. The Panther member was found to be about 36 feet thick at a depth of 315 to 351 feet. Flow from this bed varied from about 2.1-7.0 gallons per minute. Although Little Bear spring emanates out of the Panther member, age dating showed the water to be of recent age (<50 years old). Age dating of water from the Starpoint Sandstone shows it to be of an age greater than 10,000 years old. It appears that Little Bear Spring emanates from a fault zone which may be serving as a conduit for diversion of recent water intercepted in some of the larger drainages in the area. It is doubtful that mining activities would have any affect on flow from Little Bear Spring due to the large age difference between the water encountered underground and the water flowing out of Little Bear Spring.

Meetings with the Castle Valley Special Service District officials and their representatives, as well as the other water user districts of the area, were held on 10 June 1993. The concern of the Castle Valley Special Service District regarding diminution and mitigation of the Little Bear Spring flow that could result from future mining were discussed. Given the elevations of the Starpoint potentiometric surface, in relation to that of the Hiawatha Coal Seam, it was shown that the present and future mine workings would not interfere with the Starpoint aquifer.

Little Bear Spring is a developed spring that provides municipal water to nearby municipalities. It emanates from a fracture system in the Panther Member of the Star Point Sandstone that trends in an approximate northeast-southwest direction.

Because of its importance as a municipal water supply source and its proximity to proposed mining areas, Little Bear Spring has been extensively studied. Several hydrologic studies have been performed since 1977 to investigate the recharge source for Little Bear Spring (Forest Service Project File). These studies have agreed that the spring flow is supported by a fault/fracture system. Since Little Bear Spring lies more than 300 feet below the level of the mineable coal seams and past mining encountered the fault/fracture system without significant inflow of water, there is general consensus among the Castle Valley Special Service District (CVSSD), mine operators, scientific community, and the regulatory agencies that adverse effects to the spring are unlikely.

Several studies have been done that suggest a northerly component of flow feeding Little Bear Spring. These studies include:

- X Vaughn Hansen Associated, *Water Quality and Hydrologic Study in Vicinity of Huntington Creek Mine No. 4 and Little Bear Spring*, Prepared for Swisher Coal Company, August1977.
- X Hydro-Sciences, Inc., *Ground Water Hydrology in the Vicinity of the Huntington No. 4 Mine,* Prepared for ARCO Coal Company, December 19, 1980.
- X Beaver Creek Coal Company, *Huntington Canyon No. 4 Mining and Reclamation Plan,* Prepared for UDOGM, 1983.
- X Utah Geological and Mineral Survey, *Effects of Coal Mining at Huntington Canyon No. 4 Mine on Little Bear Spring, Emery County,* Prepared for Castle Valley Special Services District, Job No. 84-005, January 21, 1984.
- X Vaughn Hansen Associated, *Hydrologic Conditions in Huntington Canyon No. 4 Mine,* 1984.

These referenced studies are available for review at the Division=s Public Information Center.

Other studies indicate that the Little Bear Spring may possibly be fed by a fault/fracture system which intercepts surface water in Mill Fork Canyon southwest of the South Crandall Lease area. These scientific investigations include an investigation of the Little Bear Spring groundwater system and the groundwater systems encountered in the Crandall Canyon Mine (Appendix 7-52), a solute and isotopic investigation of groundwater from Little Bear Spring and the Star Point Sandstone and Blackhawk Formation groundwater systems the Crandall Canyon Mine (Appendix 7-53), an investigation of the hydraulic conductivity of the Star Point Sandstone in the vicinity of the Crandall Canyon Mine (Appendix 7-54), an investigation of the alluvial groundwater system in Mill Fork Canyon with implications for recharge to Little Bear Spring (Appendix 7-55), an investigation of the potential for Little Bear Spring recharge in Mill Fork Canyon (Appendix 7-56), and a fluorescent dye-tracing study that conclusively demonstrates the hydraulic connection between the stream/alluvial groundwater system in Mill Fork Canyon and Little Bear Spring (Appendix 7-57). Sunrise Engineering also performed a series of investigations using a proprietary geophysical technique that demonstrated a hydraulic connection between Little Bear Spring and the surface drainage in Mill Fork Canyon. These investigations are included as Appendix 7-59, Appendix 7-60, Appendix 7-61, and Appendix 7-62.

These studies, taken as a whole, have indicated that Little Bear Spring is possibly recharged through surface water and alluvial groundwater losses in Mill Fork Canyon, located well beyond the boundary of the South Crandall Lease area, approximately 1.5 miles southwest of the spring. The basis for this assumption is discussed briefly below. The reader is referred to the above mentioned appendices for a more rigorous discussion of the recharge of Little Bear Spring.

The assumption that Little Bear Spring may possibly be recharged from surface-water and alluvial groundwater losses in Mill Fork Canyon is based on several findings. These include:

1) the finding that, from a water budged standpoint, there is sufficient water available in Mill Fork Canyon to account for the recharge to Little Bear Spring and any surface water drainage that leaves the Mill Fork drainage and flows into Huntington Creek,

2) the finding that there is a chemical and isotopic match (or a plausible chemical evolutionary pathway) between surface waters and alluvial groundwaters in Mill Fork Canyon and groundwater at Little Bear Spring, and

3) the finding that there is a demonstrated hydraulic connection between Mill Fork Canyon and Little Bear Spring and the hydraulic gradient and flow volume through the connection is sufficient to provide Mill Fork water to the spring.

These findings are discussed below.

An investigation was performed in 2001 to determine the quantity of water available in Mill Fork Canyon to recharge Little Bear Spring (Appendix 7-56). It is the finding of this investigation that there is an excess of approximately 300 gpm in the Mill Fork drainage that is available for recharge to the spring. Indeed, it is difficult to explain the loss of approximately 300 gpm from the drainage basin without taking the recharge to Little Bear Spring into account. This finding is based on a comparative analysis of baseflow in the Crandall Creek drainage, which is very similar in geology, topography, aspect, and elevation to the Mill Fork Creek drainage. The baseflow in Crandall Canyon Creek during most years is approximately 300 gpm greater than that in Mill Fork.

Another investigation examined the capacity of the alluvial groundwater system in Mill Fork Canyon to transmit sufficient groundwater to sustain the baseflow of Little Bear Creek during periods when there is not surface flow in the Mill Fork drainage (Appendix 7-55). This investigation was based on a quantitative determination of the flow of groundwater migrating through the alluvial groundwater system above the spring recharge location compared to that flowing through the alluvial deposits below the spring recharge location in Mill Fork Canyon. It is the conclusion of this investigation that there is appreciably more groundwater flowing through the alluvial deposits above the spring recharge location as compared to that flowing in the alluvial deposits below the spring recharge location (approximately 300 gpm more).

Investigations regarding the solute and isotopic compositions of groundwater at Little Bear Spring and other shallow groundwater systems in the vicinity have been performed. These investigations have also examined the solute and isotopic compositions of Star Point Sandstone groundwater systems encountered in the Crandall Canyon Mine. These studies are included as

Appendix 7-52 and Appendix 7-53. It is the findings of these investigations that groundwater discharging from Little Bear Spring is modern in origin (<50 years old), while groundwater from deep Star Point Sandstone groundwater systems in the Crandall Canyon Mine have a mean groundwater age of many thousands of years. Shallow Groundwater systems (that provide baseflow to upper Mill Fork Creek) are modern in origin. The solute composition of groundwater in Little Bear Spring and that of surface water and shallow alluvial groundwater in Mill Fork Canyon are similar.

The fact that the discharge in Little Bear Spring shows rapid seasonal variations in discharge rate suggests that the recharge is related to a shallow recharge source that is closely tied to seasonal recharge. The ancient groundwater systems encountered in the Star Point Sandstone in area coal mines do not exhibit seasonal variability.

Finally, in order to explore the assumption that Little Bear Spring may possibly be recharged from Mill Fork Canyon, a fluorescent dye tracing study was performed in 2001 (Appendix 7-57). In this investigation, fluorescent dye was placed in the upper Mill Fork drainage immediately above the spring recharge location. A positive dye recovery occurred at Little Bear Spring within 40 days of the dye placement. Thus, a hydraulic connection between the alluvial system in upper Mill Fork Canyon was positively confirmed.

The elevation of the spring recharge location in upper Mill Fork Canyon is approximately 7710 to 7790 feet, while the elevation of Little Bear Spring is approximately 7475 feet. Thus, there is a substantial hydraulic gradient between the possible Mill Fork recharge location and Little Bear Spring. It is important to note that the possible recharge location for Little Bear Spring in Mill Fork Canyon is outside the boundaries of the South Crandall Lease area. Likewise, the groundwater flowpath connecting Mill Fork Canyon and Little Bear Spring is outside of the area of potential coal mining by Genwal Resources.

While the flow mechanisms conveying water to Little Bear Spring are not completely understood, additional hydrologic studies performed since the Mill Fork EA was written have indicated that adverse impacts to the spring are not expected due to the vertical separation between the coal seams and flow. (Forest Service, BLM Joint Decision Notice/Finding of No Significant Impact, Coal Lease Application UTU-78953)

In conclusion, because mining occurs above the Panther Member of the Star Point Formation, the source of water of the Little Bear Spring; because the mine is relatively dry; and because age dating has shown that the water sampled underground from the Starpoint Sandstone and from Little Bear Springs are not the same age (: there is little, if any chance, that current or proposed future mine workings of the Crandall Canyon Mine could affect the Little Bear Spring. Operation of the mine should not adversely impact the Star Point aquifer or Little Bear Spring.

Mitigation for potential disruption to the Little Bear Spring will be accomplished though the construction of a water treatment plant which will provide replacement water for the spring. Construction of this water treatment plant will be done under the provisions of a water replacement agreement between Genwal Resources, Inc. and the Castle Valley Special Service District who maintain culinary water rights to Little Bear springs. A copy of this water replacement agreement is included in Appendix 7-51. With construction of this water treatment plant an uninterrupted supply of culinary water will be assured irrespectively of whether mining can be conclusively shown to have affected Little Bear Spring. This is in compliance with special stipulation #17 of federal lease UTU-78953 (see Appendix 1-13).

Spring and Seep Interception.

There is a potential for impact to overlying seeps and springs through interception of the perched aquifers as a result of subsidence. Seeps and springs throughout the mine area and the South Crandall Lease area and the U-68082 lease mod area have been identified through intensive field and aerial surveys. These survey results are presented in Chapter 7, Section 7.24.1, associated appendices, and are shown on Plate 7-12. Water rights have also been researched and are provided in Chapter 7, Table 7-6.

Genwal is currently monitoring the water flow rates and quality of representative springs and seeps as indicated in section 7.31 within and adjacent to the current mine permit area (including LBA No. 9 and the South Crandall Lease area). The springs which are monitored cover both the proposed aerial extent of the mine and also are located within each of the major lithologic units from the Blackhawk (above the regional aquifer) to the North Horn Formation (which caps the highest portions of the top of East Mountain).

As stated in Section 7.24.1, the water emitting from seeps and springs which overlie the coal seam originates from perched aquifers. These perched aquifers appear to have no direct communication with the Star Point Sandstone, or with the mine. Isotopic sampling has shown the chemistry of these springs to be substantially different than water from underground sources or the Starpoint Sandstone. These springs do not appear to have any vertical communication with the Blackhawk or Star Point Sandstone formations even when subsidence has occurred. This is due to the extensive interbedded shale in the intervening strata. Also, during the drilling conducted for the LBA No. 9 only one hole, DH-7, intercepted any groundwater. These data indicate that a significant zone of non-saturated, low-permeability strata (aquitard or aquiclude) are present between the Star Point Sandstone and the overlying perched aquifers.

~~Natural groundwater inflow to the Crandall Canyon Mine is limited. Inflows~~ During the period of active mining, inflows into the Crandall Canyon Mine were usually modest in magnitude and of short duration ~~to be of short and limited duration~~. Most of the natural inflows are from mined-out areas of the longwall. Less frequently, natural inflows occur from bolt holes in the roof and from very limited sections at the face. As mining occurred in the northwest portion of the mine in Sections 26 and 35, T15S, R6E, appreciable groundwater inflows were encountered. Most of this groundwater entered the mine workings from fracture zones in the mine roof. This groundwater discharge appeared to be associated with release of groundwater from storage in fractured paleochannel systems overlying the Hiawatha coal seam. The fracture systems from which the groundwater emanated are likely associated with synthetic faulting related to the Joes Valley Fault system.

Genwal has an operational monitoring plan which includes monitoring surface flows from Crandall, Blind Canyon and Indian Creeks using flumes and continuous recorders. In addition, Genwal has committed to monitor Horse Canyon at station H-1 on a quarterly basis. Genwal is currently monitoring ~~14~~24 springs on a quarterly basis across their potential area of influence (see Chapter 7 for additional details).

Prior to about 1996, due to the dryness of the mine, water from Crandall Creek had been pumped into the mine to provide dust control water and water for the mining equipment. A water supply well provided~~s~~ shower water for the bathhouse. This well (MW-1) is no longer operative in the now closed Crandall Canyon Mine. Based on the 1992 mine water records, approximately 6.9 million gallons of water were used in the mining operation. Of this volume, it is estimated that approximately 6.2 million gallons of water were pumped into the mine from either the water supply well MW-1 or from Crandall Creek. These volumes indicate that the water collected from natural inflow underground was approximately 700,000 gallons, which is about 10 percent of the 1992 water usage. This amounts to a 1.3 gpm inflow rate. Much of the natural inflow water is used in the mining operation. Discharge from the mine had occurred only 3 times prior to 1990. Beginning in January 1996, relatively continuous discharge of mine water began to occur. A plot of Crandall Canyon Mine discharge as monitored at UPDES 002 is presented in Figure PHC-1. It is apparent in Figure PHC-1 that mine-water discharge rates increased gradually from 1996 to 2001. Discharge from the mine peaked during the period from 2001 through 2004, with discharges commonly exceeding 1,000 gpm. After 2004, discharge data from the mine show a gradual decreasing trend. During the first three quarters of 2010, the reported discharge has averaged about 500 gpm.

In the event that a subsidence fracture did reach the surface or intercept one of the overlying perched aquifers, it is likely that the affect would be temporary in nature. As indicated in Appendix 7-41, the clays within the Blackhawk Formation have a tendency to swell when exposed to water. Therefore, if the fracturing from subsidence did intersect a saturated, perched aquifer and conveyed water, the clays within the formation would swell and seal the fracture. This self-healing condition has been identified within the headwaters of the Huntington Creek drainage (DeGraff, 1978) and at other mines in the area.

An alternative water source plan has been developed in the event any water rights or springs/seeps impacted in a long-term manner by the mining operation or reclamation activities. This plan is detailed in Chapter 7, Section 7.27.

Surface Water Interception.

The possible surface water interception impacts may affect stream flows in Crandall Canyon, Blind Canyon, Horse Creek, the headwaters of Indian Creek, and drainages in the South Crandall Lease area and in the U-68082 lease mod area. These impacts would likely be the result of subsidence fractures intersecting the ground surface. If these fractures occur within or across a surface drainage channel, then a potential is created for the surface flow within the drainage to be temporarily intercepted. For the drainages within and adjacent to the Crandall Canyon Mine, all sections of the streams that are perennial will be protected from subsidence by limiting retreat mining activities within the area of the stream buffer zones as discussed in Section 5.25 of this permit.

The potential for significant water loss for these drainages is minimal. This conclusion is based on the existing hydrologic and geologic information presented in Section 7.24 and Appendices 7-2 and 7-23 and past mining experience within the Huntington Creek drainage. In addition, the streams in the majority of the surface area which overlies the current or proposed mine workings are ephemeral. However, due to the concerns raised by the U.S. Forest Service, regarding their uncertainty in supporting this conclusion, Genwal Resources Inc. has initiated extensive studies of within Blind and portion of Crandall Canyon to determine if mining through these drainages have an adverse affect on the surface or groundwater resources within the drainage. Until the results of these studies are determined, Genwal will continue to protect those portions of the streams that have been proven to be perennial.

It is important to note that the geologic units located in the formations stratigraphically above the Blackhawk Formation and the Hiawatha coal seam at the Crandall Canyon mine are hydrologically isolated from the contiguous area. East Mountain is bounded on the north by the South (Left) Fork of Huntington Creek; on the west by Upper Joes Valley; on the south by Cottonwood Canyon; and on the east by Huntington Canyon. Data show that the regional aquifer is located below the Hiawatha Coal. Field data indicate that Blind Canyon is ephemeral and that Horse Canyon is perennial only in that area where it intersects or is below the regional aquifer. Based on the baseline data (Appendix 7-58), it is apparent that all of the surface-water drainages in the South Crandall Lease area are likely ephemeral or intermittent in nature. The drainages in the U-68082 lease mod area are all ephemeral or intermittent.

The perennial portion of Crandall Canyon extends above the regional aquifer. This occurs because the perched Price River and North Horn Formation cover a broader area of this watershed and because Crandall Canyon has a larger drainage area (and thus, more potential for recharge and increased runoff) than the other two canyons.

Consumption.

The consumption of water by the mining operation is a combination of moisture added to the mined coal through the mining process and that which is extracted with the coal as well as evaporation due to ventilation of the mine workings. It is estimated that mining extraction and the mining process utilize approximately 200 gpm during the two 8-hour mining shifts per day. The volume of water extracted by ventilation is estimated to be approximately 50 gpm.

Seepage from Mine Sumps.

Underground sumps are utilized to store water pumped underground or collected from groundwater inflows until the water is used as mine process water. During the period that water is stored in these sumps it is probable for some seepage to occur to the underlying formation (Spring Canyon member). For the Crandall Canyon Mine, the potential volume of such seepage is expected to be quite low because of the presence of a fine grained mudstone strata underlying the Hiawatha seam within the Blackhawk Formation. This layer limits the downward movement of seepage to a very slow rate.

Pumping from Crandall Creek.

Due to the past need for supplemental water underground, there is also potential for decreased surface flows in Crandall Canyon due to pumping from Crandall Creek. Surface water availability could only be impacted by excessive pumping of water from Crandall Creek for the operation. This is not expected to occur since Genwal has committed to not pump from Crandall Creek at a rate that will dewater the stream. (Chapter 7, Section 7.24.2). (Genwal will have determined the baseline water flow which needs to remain within Crandall Creek to sustain the existing flora and fauna by August 31, 1995).

Water Quality Impacts.

The quality of the surface and groundwater in the mine area may potentially be affected by increased sediment loading, dust from the operations, mine water discharges, hydrocarbons used in the mining operations, and seepage losses from within the mine. The following sections discuss these potential impacts and mitigating measures.

With the installation of the main diversion culvert during the expansion of the mine yard facility area it is possible that additional sedimentation could occur. Genwal will install a pair of silt fences downstream in Crandall Canyon to collect any suspended material that may occur as a result of the installation of the 18" drain pipe bedded in drain rock or the 72" culvert. The silt fences will be checked periodically and cleaned out as needed to maintain maximum efficiency.

Once the culvert is in place and operable, the creek will be diverted through the culvert thus bypassing the disturbed area and minimizing the potential for runoff from the disturbed area accidentally flowing directly into the creek. The sediment pond may experience an increase in sediment loading during the construction process and until the construction has been completed. This would be a short term effect. The sediment pond will also be enlarged during the construction process to accommodate the increase in disturbed area. The net result will be that the pond will be better suited to handle runoff from the disturbed area once it has been reconstructed and enlarged. Drainage from the Forest Service parking area will now report directly to the sediment pond. All drainage from the disturbed area will report directly to the sediment pond and the potential for drainage to bypass the sediment pond and flow into the creek untreated will be virtually eliminated.

Flow in Crandall Creek will be temporarily (during the remainder of the life of the mine) diverted through the 72" culvert. However, when reclamation occurs, the channel will be replaced exactly in the same location as it existed prior to the culvert placement. Genwal will lay a geotextile over the existing channel to preserve the channel morphology prior to installation of the drain rock and 18" drain pipe. The drain rock and drain pipe will serve to allow any drainage from the channel bed or adjacent seepage from colluvial materials to flow downstream. Then, the 72" diversion pipe will be placed over this drain. The drain will preserve the integrity of the fill, thus minimizing the potential for problems from settling of the 72" pipe and ensuring the successful operation of the bypass culvert.

Increased Sediment Loading.

As discussed in Section 7.24.2, the permit area is drained by ephemeral, intermittent, and perennial watersheds. These watersheds are steep (with average slopes 50 percent) and well vegetated (with vegetative cover also often exceeding 50 percent). The primary potential for impact to surface water is in the form of increased sedimentation from the operations.

Sediment yield will naturally increase (on a temporary basis during construction and revegetation) from areas disturbed for the operation. A runoff control plan, required by the Division of Oil, Gas, and Mining, provides for the containment or treatment of all runoff and sediment produced from the disturbed areas. Based on this plan, described in Chapter 7, Section 7.42.22, the majority of the disturbed area runoff is directed to the sediment pond. The designed sediment storage for the pond is 1.02 acre feet, including 0.084 acre feet from disturbed areas and 0.018 acre feet from undisturbed and reclaimed areas, over a 10 year period. Storm runoff was determined to be 1.98 acre feet. The pond is designed with a total storage volume of 3.27 acre feet, which allows for complete containment of sediment.

There are 7 small areas (ASCA 2, 5, 6, 7, 8, 9, & 10) which do not drain to the sediment pond, as shown on Plate 7-5, and described in Chapter 7, Section 7.42.21. Sediment yield from these areas is minimized through the use of sediment traps, straw bale dikes, silt fences, and vegetation as described in Section 7.42.21. Sediment yield from the facility and the disturbed areas is minimized through the installation and maintenance of the above described controls.

A secondary potential source may exist due to subsidence creating surface irregularities which would be more susceptible to erosion. Calculations presented in Appendices 7-27 to 7-40 indicate a very small potential for increased sedimentation reaching a perennial stream. A study has been conducted by Genwal and the U.S. Forest Service in Blind Canyon to measure the amount of subsidence, erosion, and the associated sediment yield which may be produced as a result of current mining operations. (Refer to Appendices 7-38 and 7-39).

Fugitive dust.

The potential impacts of fugitive dust from the Crandall Canyon Mine include reduced air quality in the facilities area and a small decrease in the surface water quality of Crandall Creek. The air quality degradation result from particulate emissions from the paved road and pad, reclamation activities, and from coal loading operations. The water quality degradation and sediment loading increase would result from the settlement of dust within the waters of Crandall Creek. Placement of the stream within the culvert under the expanded mine yard will serve to minimize the possibility of coal dust settling in Crandall Creek.

These impacts are mitigated by sweeping the paved access roads and portions of the pad, water sprays in the coal handling process, and contemporaneous reclamation. These actions minimize the dust production from the facilities area.

Oil and grease.

The use of oil, grease, and flammable hydrocarbon-based products in the mine facilities area creates the possibility of contamination within and adjacent to the facilities area. Contamination could result from spillage of these products during maintenance of the mine equipment, accidental spillage during filling of fuel tanks, or leakage from equipment during operations. Such contamination could impact the soils, groundwater, and possibly surface waters downstream of the facility.

The impacts from spillage during maintenance activities and during filling of tanks will be mitigated by the implementation of the SPCC plan. Additionally, the runoff from all areas of the site where equipment will be operating is drained to the sedimentation pond. The pond is equipped with an oil and grease skimmer to prevent the release of hydrocarbons.

Mine water discharge.

A potential impact to water quality would be from mine water discharges. ~~Currently there is~~ Prior to early 1996 there was no appreciable discharge from the Crandall Canyon Mine. ~~However, when the underground sumps are full and mining consumption is minimal, such as during a longwall move or vacation, discharges may occur.~~ Prior to 1990, there were only three discharges from the mine and these discharges were of a limited nature in both duration and quantity. The mine has an UPDES discharge permit.

From early 1996 until the mine was sealed in September 2007, mine water was routinely discharged from the Crandall Canyon Mine to Crandall Canyon Creek. The quality of the mine discharge water was good, and almost always met the requirements of the UPDES discharge permit. Information on water quality and water discharge rates from the Crandall Canyon Mine (and also from all other monitoring sites) has been submitted quarterly to the Utah Division of Oil, Gas and Mining and is available for inspection at http://ogm.utah.gov/coal/edi/wqdb.htm (UDOGM, 2011). The total dissolved solids (TDS) concentrations of mine discharge waters are plotted in Figure PHC-2. It is apparent in Figure PHC-2 that the TDS concentrations of mine discharge waters prior to the cessation of pumping in 2007 were (with a single anomalous exception in 2004) less than about 625 mg/L (see monitoring site UPDES 002, UDOGM, 2011). Total iron concentrations in the mine discharge water during this period were almost always substantially less than the UPDES discharge permit limit of 1 mg/L.

Beginning in January 2008, after a period of several months with no discharge subsequent to the cessation of pumping of mine discharge water, groundwater began to discharge from the Crandall Canyon Mine portals via gravity drainage. It should be noted that, based on the geometry of the Crandall Canyon Mine workings (with the lowest elevation regions occurring in the southern part of the mine), large portions of the mine workings likely remain free of mine water.

The TDS concentrations of the mine discharge waters that initially flowed from the Crandall Canyon Mine portals in early 2008 were somewhat elevated relative to that pumped prior to the mine's closure (see Figure PHC-2 and monitoring data for site UPDES 002 in the

UDOGM online coal hydrology database, 2011). The elevated TDS concentrations were likely attributable to the initial flushing and dissolution of soluble minerals or other materials present in portions of the mine that had not previously been inundated with water. TDS concentrations of the mine water subsequent to its first discharge from the mine portals lowered precipitously during the first several months of discharge (Figure PHC-2). After a period of approximately 30 months, TDS concentrations in mine discharge waters had completely returned to the levels observed prior to the mine collapse event and the subsequent cessation of pumping of mine water in 2007.

Since gravity discharge from the Crandall Canyon Mine commenced in early 2008, total iron concentrations in the mine discharge waters have been elevated relative to the total iron concentrations of mine waters discharging prior to mine closure (See Figures PHC-2 and PHC-3; UDOGM, 2011). The likely source of increased total iron concentrations in the mine discharge water is the oxidation of sulfide minerals (such as pyrite) that have come into contact with oxygenated water in the newly flooded portions of the Crandall Canyon Mine.

It is apparent from the data plotted in Figure PHC-4 that total iron concentrations in the Crandall Canyon Mine discharge water peaked at a concentration of 8.03 mg/L in October 2009. It is apparent in Figure PHC-4 that since that time, total iron concentrations in the pre-treatment mine discharge water have been declining gradually. During the fourth quarter of 2010, total iron concentrations in the mine pre-treatment water were 2.81, 3.19, and 3.29 mg/L in October, November, and December, respectively, averaging 3.1 mg/L. Thus, the fourth quarter 2010 average total iron concentration in mine discharge water (untreated) represents a decrease of more than 60% relative to the October 2009 peak concentration over this approximately 12 to 14 month period.

In response to the increased total iron concentrations in the Crandall Canyon Mine discharge water, Genwal Resources, Inc. has constructed and operates a treatment facility that removes iron from the water prior to its discharge into Crandall Canyon Creek. Details of the treatment facility are provided in Appendix 7-65. Subsequent to the installation and successful operation of the treatment facility, total iron concentrations in the mine discharge water (UPDES 002) are now routinely in compliance with the 1 mg/L discharge limit established in the UPDES discharge permit (See Figure PHC-4; UDOGM, 2011).

A well oxygenated surface stream with near-neutral pH will rarely contain more than a few micrograms per liter of dissolved iron (Hem, 1985). Dissolved iron species in such streams are readily precipitated as solid precipitates (commonly iron hydroxides) which will settle to the bottom of the stream bed or may be incorporated as co-precipitates with other mineral precipitation processes. Accordingly, because elevated dissolved iron concentrations are not likely to persist in the well-oxygenated creek, the potential for significantly impacting iron concentrations in Huntington Creek into which Crandall Canyon Creek flows (more than a mile below the mine water discharge point) is considered minimal. Concentrations of total iron in Crandall Creek water above the mine water discharge point (at UPF-1), and immediately below the mine water discharge point (at LOF-1) are shown on Figure PHC-5.

Prior to the installation and operation of the iron treatment facility, some discoloration of the Crandall Canyon Creek stream substrate near and below the mine-water discharge point was observed. The discoloration of the creek likely resulted from the presence of iron hydroxide precipitates.

Whole effluent toxicity (WET) testing of Crandall Canyon Mine discharge water has occurred routinely subsequent to the onset of gravity discharge from the mine portals. The mine discharge water has routinely passed the WET tests during this period, indicating a lack of toxicity of the mine discharge water. WET testing of the chemically treated mine discharge water has been performed subsequent to the operation of the mine's iron treatment facility~~.~~ on a semi-annual basis. The first half of 2010 treated mine discharge water successfully passed the WET testing (the laboratory WET testing procedure for the second half of 2010 mine discharge sample is currently in progress has not yet been completed). The fact that the treated mine discharge water passes the WET testing indicates a lack of toxicity.

The aquatic habitat of Crandall Canyon Creek has also been evaluated previously by JBR Environmental Consultants, Inc. In a report entitled *Crandall Canyon Mine Macroinvertebrate Study September 2009*, JBR evaluated the aquatic habitat by sampling the creek's benthic macroinvertibrates and assessed the resultant data to determine whether or not the mine discharge is affecting Crandall Creek's aquatic community. JBR found that overall, while both the upper and lower monitoring sites continue to support a variety of macroinvertebrates, the Crandall Creek macroinvertebrate community downstream of the mine's discharge was negatively impacted relative to the sampling site upstream of the mine discharge. However, they considered attributing the degradation directly to iron in Genwal's mine water discharge to be problematic. It should also be noted that this represents a potential impact that occurred prior to the onset of chemical mine-water treatment. Genwal Resources, Inc. has committed to performing ongoing routine monitoring of the macroinvertebrate community in Crandall Canyon Creek in the future. The future sampling will provide additional data, which will be used to assess continued impact or recovery as the mine discharge water is now treated.

Subsequent to the construction and operation of the iron-treatment facility for the Crandall Canyon Mine discharge, the treated mine discharge water is currently being discharged in compliance with all relevant regulations and guidelines. Impacts to the hydrologic balance resulting from the discharge of mine water are being minimized. To summarize current mine water discharge conditions:

1) The iron treatment facility (which uses both chemical and physical treatment processes) is successfully reducing total iron concentrations in the mine discharge water to levels in compliance with the UPDES permit (continuously for the last 10 months).
2) The use of chemicals in the iron treatment facility at the Crandall Canyon Mine is in compliance with relevant NSF 60 standards for drinking water treatment chemicals.
3) Whole effluent toxicity testing of the treated mine discharge water indicates a lack of toxicity.

4) All applicable regulations and guidelines for the mine water discharge are currently and consistently being met, demonstrating the capability of Genwal Resources, Inc. to remain in compliance with the stipulations of the mine water discharge permit.

While the precise length of time during which elevated iron concentrations will persist in the untreated Crandall Canyon Mine discharge is difficult to determine with certainty, it is considered very likely that iron concentrations will gradually decline over time. This is because the system is reactant-limited. Crandall Canyon Mine waters that were pumped to the surface prior to the closure and sealing of the mine were consistently low in iron content (Figure PHC-3; UDOGM, 2011). These waters flowed over the mine floor and were held in underground sumps prior to being discharged to the surface via pumping. Subsequent to the mine closure and the cessation of mine water pumping, groundwaters within the mine likely came into contact with portions of the mine that had not previously been inundated with water prior to reaching the surface. This may include areas where coal debris resulting from the mine collapse event was emplaced in mine entries. Over time, the sulfide minerals exposed in the newly flooded portions of the mine will either 1) become depleted due to removal of the iron by oxidation processes (i.e. become consumed and flushed from the system as iron and sulfate in the mine discharge water), or 2) become non-reactive as the necessary chemical reactants facilitating the sulfide mineral oxidation processes become unavailable (i.e. depletion of dissolved oxygen levels in the mine water for example). Because there is not an unlimited supply of exposed and available sulfide mineral in the newly flooded portions of the mine, it can be stated with confidence that the discharge of iron from sulfide mineral oxidation <u>cannot</u> continue in perpetuity.

It should also be noted that, while damage occurred to pillars in some portions of the mine in conjunction with the August 2007 mine collapse event, such damage likely did not occur over widespread portions of the mine. In their July 2008 report of the August 2007 mine collapse incident, the Mine Safety and Health Administration (MSHA) provide a delineation of the likely spatial extent of collapse damage in the mine. This report includes a delineation of the approximate extent of "extensively damaged pillars" as well as a delineation of the approximate extent of "damaged pillars" (see Figure 33 on page 61 of the MSHA report). It is significant to note that the total acreage of "damaged" and "extensively damaged" pillars is on the general order of the size of one of the typical longwall panels in the Crandall Canyon Mine adjacent to the collapsed area.

Inasmuch as more than three years have transpired since the tragic August 2007 mine collapse event (and the performance of any underground mining activities in the area), it seems unlikely that seismic activity in the mine area of significant magnitude to rubbleize currently in-tact coal and expose appreciable amounts of sulfide minerals to oxygenated mine water will occur in the future.

Based on these considerations and the recent trends in total iron concentrations observed in the mine discharge water, together with previous experiences at the Crandall Canyon Mine and other coal mining operations in the Wasatch Plateau, it seems reasonable to conclude that the elevated iron concentrations in the Crandall Canyon Mine discharge water likely will not persist more than about 10 years.

The quantity of water in Crandall Creek increases substantially when Crandall Canyon Mine discharge waters are discharged into the creek. Typically, during mid-summer and low-flow conditions, the amount of water in the creek more than doubles as a consequence of the inclusion of the mine discharge water (UDOGM, 2011). The additional modest quantity of flow in the creek, particularly during the low-flow season, is likely beneficial to aquatic habitat rather than being detrimental to the overall aquatic habitat.

In order to further evaluate and characterize the potential effects of the Crandall Canyon Mine discharge water on Crandall Canyon Creek, extensive monitoring of mine discharge rates and mine discharge water chemical compositions will be carried out. The proposed monitoring plan for the Crandall Canyon Mine discharge water (prior to any treatments) is presented below:

Water monitoring protocols for Crandall Canyon Mine discharge water (untreated mine discharge)		
Parameter	**Reported as**	**Frequency**
Field Parameters		
Mine discharge	gpm	Daily
Temperature	°C	Monthly
pH	S.U.	Monthly
Specific conductance	µS/cm	Monthly
Dissolved oxygen	mg/L	Monthly
Ferrous Iron (field)	mg/L	Monthly
Laboratory analyses		
Calcium (dissolved)	mg/L	Monthly
Magnesium (dissolved)	mg/L	Monthly
Sodium (dissolved)	mg/L	Monthly
Potassium (dissolved)	mg/L	Monthly
Bicarbonate	mg/L as CaCO3	Monthly
Carbonate	mg/L as CaCO3	Monthly
Sulfate	mg/L	Monthly
Chloride	mg/L	Monthly
Aluminum (total)	mg/L	Monthly
Aluminum (dissolved)	mg/L	Monthly
Iron (total)	mg/L	Monthly
Iron (dissolved)	mg/L	Monthly
Manganese (total)	mg/L	Monthly
Silica	mg/L	Monthly
TDS	mg/L	Monthly
TSS	mg/L	Monthly
Alkalinity (total)	mg/L as CaCO3	Monthly
Hot acidity (by SM 2310B 4(a))	mg/L	Monthly

The water monitoring data for the untreated mine discharge water outlined above will be submitted to the Division monthly. The water chemistry and measurement data will be submitted electronically using the Division's water monitoring database EDI system. Mine-water discharge rate data will be provided in a spreadsheet format or other format acceptable to the Division. The monitoring of the untreated mine discharge water will be conducted for the life of the permit or until the Division deems it no longer necessary.

The monitoring data will be used to detect and characterize any potential changes in the quantity or quality of Crandall Canyon Mine discharge water. This may be accomplished by evaluating changes or significant trends in individual monitored parameters over time (i.e. comparing previous chemical compositions or discharge rates with current chemical compositions or discharge rates). This information may then be used to determine whether adverse impacts to the quality or quantity of the receiving water (Crandall Canyon Creek) are occurring or are likely to occur. The monitoring data may also be used in future geochemical evaluations of the hydrogeochemical regime in the Crandall Canyon Mine.

Acid-toxic materials.

As discussed in Section 5.28.30, waste rock is not normally produced during mining operations. When incidental quantities of rock are encountered, the rock is left in the mine and will not be removed in the future; thus, the strata which overlie and underlie the Hiawatha seam are not expected to cause any negative effects or create acid-forming potential. ~~Additionally, the mine is currently considered to be a "dry mine" and the minimal volume of water that is encountered underground does not exhibit any acid or toxic characteristics.~~ All waters encountered have had a near neutral to slightly alkaline chemistry. Laboratory data have shown that no materials are present within the coal, underburden, overburden, etc. which are of an acid or toxic nature.

Further, handling plans have been implemented for earth, refuse, and acid-toxic forming materials (if encountered), which, if needed, will prevent or control discharge of pollutants to the hydrologic system (Section 7.31.3). This will be accomplished using the best technology currently available.

However, to further characterize the acid-forming potential of strata immediately above and below the Hiawatha seam, the applicant has collected roof-, floor-rock, and coal samples from locations within the current mine workings. Analytical results from these sets of samples, Appendix 6-2, indicate that acid and toxic forming materials are not present within the overburden or underburden.

Flooding or Streamflow Alteration.

The potential for flooding is minimized by the design and installation of adequately sized diversions, sediment pond and velocity control structures as described in Chapter 7, Section 7.40. All diversions are sized for a 25 year - 24 hour storm event. Ditches, culverts and sediment pond are designed for a 10 year - 24 hour storm event. Ditches, culverts and sediment pond are designed for a 10 year - 24 hour storm event.

Crandall Creek will be culverted for a distance of about 1,100 feet through the expanded mine yard area. While a minimal short term impact will occur as the culvert is being installed, the long term affect will be to reduce the potential for sediment to flow from the disturbed area into the creek. It will also reduce the potential for flow within Crandall Creek to impinge upon the sediment pond embankment due to their close proximity. The slopes of the sediment pond will be 2:1 on the outslope. The toe of the sediment pond has been fortified with an additional 2 feet of 12.5 inch D-50 rip-rap for protection and stabilization. The culvert outlet downstream from the pond will minimize the potential for impact from running water to damage the sediment pond embankment. An analysis of the Crandall Creek flow and pond protection measures indicates that these measures are adequate for a return period in excess of 10,000 years (Section 7.42.22). A slope stability analysis has also been performed on the pond embankment, indicating it meets the required slope-stability safety factors (Chapter 7, Table 7-7).

R645-301-728.200 Basis for Determination

The PHC Determination for this operation is based on baseline hydrologic, geologic, and other information gathered specifically for this site and the surrounding area by the permittee. This includes information from the South Crandall Lease area and from the U-68082 lease mod area. Additionally, regional information has been provided through various published reports as noted in the plan.

Specific groundwater information is provided in Section 7.24.1 and Appendices 7-16, 7-17, 7-18, 7-19, 7-21, 7-24, 7-40, 7-41, 7-43, 7-46, 7-47, and 7-48 of Chapter 7. Surface water data is presented in Section 7.24.2 and Appendices 7-14, 7-23, 7-25, 7-26, 7-27 through 7-39, 7-43, 7-44, 7-45, and 7-48 of Chapter 7. Geologic information is provided in Chapter 6 and Section 7.24.3, while climatic information is provided in Section 7.24.4.

R645-301-728.300 Findings

7.28.310

Chapter 7, Sections 7.24.1 and 7.24.2, indicate the potential for adverse impacts to the hydrologic balance to be minimal in both the existing permit area and in the South Crandall Lease area, and in the U-68082 lease mod area. The basis for this determination is through extensive studies, past and on-going groundwater and surface water monitoring, past history, and performance of the on-going operation, and various protection plans for operations and reclamation. A summary of potential impacts is provided in Table 1 of this PHC.

7.28.320

Waste rock is produced in limited quantities on a very infrequent basis during mining operations. When incidental quantities of rock are encountered, the rock is left in the mine and will not be removed in the future. These conditions, coupled with the fact that the waste rock does not have acid or toxic characteristics indicate that little potential exists for any impacts from toxic- or acid-forming materials.

Further, handling plans have been implemented for earth, refuse, and acid-toxic forming materials, which, if needed, will prevent or control discharge of pollutants to the hydrologic system (Section 7.31.1). This will be accomplished using the best technology currently available.

7.28.330

~~The following are expected impacts from the coal mining and reclamation operation:~~

The following subsections describe the potential impacts from the coal mining and reclamation operation.

7.28.331

Sediment yield does naturally increase on a temporary basis from areas disturbed for the operation. However, the majority of the disturbed area runoff is directed to the sediment pond. The pond is designed with a total storage volume of 0.98 acre feet, which allows for complete containment of sediment. The 7 small areas which do not drain to the sediment pond, as shown on Plate 7-5, are treated through the use of sediment traps, straw bale dikes, silt fences, and vegetation.

Genwal, in cooperation with the U.S. Forest Service, is conducting detailed sedimentation and erosion studies in the Blind Canyon watershed to determine the exact impact of mining and subsidence. To date, negative impacts to intermittent and perennial streams by sediment loading and increased turbidity has not been observed in the permit area.

7.28.332

Water quality parameters, including acidity, total suspended solids and total dissolved solids, are not expected to be impacted by the mining or reclamation operations. This determination is based on information provided in Chapter 7, Sections 7.24.1 and 7.24.2, and by results of the on-going water monitoring program detailed in Section 7.31.2.

It is unlikely that groundwater quality or quantity will be affected by the underground mining operation (as discussed in Section 7.24.1 and associated appendices, and Section 7.28.100). There exists a potential for impacts to the surface water. However, these potential impacts are expected to be minimal for the following reasons:

(1) Sediment controls are in place and maintained to minimize sediment loading to drainages;

(2) All discharges from the sediment pond (or mine) are conducted in accordance with requirements of a U.P.D.E.S. Permit; Where elevated total iron concentrations (above UPDES discharge permit limits) in mine discharge waters may occur, the water will be treated to remove excess iron prior to discharge to receiving waters;

(3) Historical data from this site (which is summarized in the Annual Report and Appendices 7-16, 7-17, 7-18, 7-19, 7-21, 7-24, 7-40, 7-41, 7-43, 7-46, 7-47, and 7-48) show no indication of mine related impacts on the hydrology of the area, other than the permitted discharges of mine water to Crandall Creek regulated under the mine's UPDES permit;

(4) The water monitoring program will continue to be followed as described in Chapter 7, Section 7.31.2. Results will continue to be analyzed and any problem areas noted will be corrected to prevent

further impacts to the hydrology. As requested by the Division, recent water monitoring data (through the third quarter of 2010)

728.333

The potential for flooding of the surface facilities is minimized by the design and installation of adequately sized diversions, sediment pond and velocity control structures as described in Chapter 7, Section 7.40.

728.334

The Crandall Canyon Mine is expected to have little impact on groundwater. ~~As mentioned earlier, the mine does not appear to have any hydrologic connection to surface water above the mine nor any connection to groundwater in the Star Point Sandstone below.~~

Monitoring of in-mine and surface monitoring wells drilled within and adjacent to the Crandall Canyon Mine and completed in the regional Blackhawk-Starpoint aquifer indicate the potentiometric surface of this aquifer generally lies 50 to 60 feet below the top of the Star Point Formation in all but the westernmost portion of the mine. Thus, mining of the Hiawatha Coal Seam at the base of the Blackhawk Formation, overlying the Star Point Formation, will not intersect and drain any water from the regional aquifer. Nor would water from underground mining enter the Star Point Sandstone due to the relatively impermeable shale zone that lies between the Hiawatha seam and the sandstone below.

There may be some potential for impact to seeps and springs through subsidence. Genwal is currently monitoring the water flow rates and quality of the water rights associated with seeps and springs within and adjacent to the current mine permit area. No evidence of impacts has been identified; however, an alternative water source plan has been developed in the event any water rights or springs/seeps are adversely affected by the mining operation or reclamation activities.

At the request of the Division, an analysis of water-monitoring data at the Crandall Canyon Mine through the third quarter of 2010 has been performed. All related water-monitoring information has been submitted electronically to the Division's on-line hydrology database located at http://ogm.utah.gov/coal/edi/wqdb.htm.

As part of the requested analysis of water-monitoring data, graphs of discharge, specific conductance, and pH are provided together with plots of the Palmer Hydrologic Drought Index (PHDI) for Crandall Canyon Mine monitoring sites in PHC-Attachment 1. The PHDI is a monthly parameter that is generated by the National Climatic Data Center (NCDC) that indicates the severity of wet or dry spells. The PHDI is useful in evaluating spring or stream discharge data to determine whether variability in spring or stream discharge rates is related to climatic variability or attributable other factors.

Based on the analysis of all monitoring information performed in this investigation, it is concluded that, other than the permitted discharge of mine discharge water to Crandall Creek, which is regulated under a UPDES discharge permit, there are no indications of adverse impacts to water quality or water quantity that could be attributed to mining-related activities. It is apparent that effects of both seasonal and climatic variability influence conditions at monitored springs and streams in the mine area. Other than the permitted discharge of mine water to Crandall Creek with likely temporarily increased total iron concentrations as discussed previously, there is no indication that the events associated with the August 2007 mine collapse event have had any perceptible or quantifiable impacts on water quality or water quantity in surrounding streams or springs. Similarly, no perceptible or quantifiable impacts to water quality or water quantity in streams or springs overlying mine areas that could be attributed to the current discharge of mine water from the Crandall Canyon Mine portals have been identified.

Similar comprehensive analyses of water-monitoring data from the Crandall Canyon Mine have previously been provided yearly in annual reports of water monitoring activities submitted to the Division. An analysis of all monitoring data collected during 2010 will be provided to the Division with the submittal of the 2010 annual report of water monitoring activities.

The groundwater system that supports discharge at Little Bear Spring will not be subsided. As discussed above, the groundwater discharging from the spring is NOT derived from a regional Star Point aquifer. Rather, it is recharged from surface-water and alluvial groundwater losses in Mill Fork Canyon outside of the permit area. The significant fracture in the Star Point Sandstone from which the spring discharges serves primarily as a conduit for the conveyance of the Mill Fork water to the spring. Groundwater in the Star Point Sandstone that is not within the fracture system does not contribute appreciable quantities of groundwater to the spring. For these reasons, the potential for impacts to Little Bear Spring resulting from mining operations in Genwal=s permit area is considered extremely unlikely.

Impacts to the surface water quality and quantity are minimized through the installation and maintenance of surface runoff and sediment control structures, and a commitment (Section 7.24.2) to not pump from Crandall Creek at a rate that will cause the in-stream flow to decrease below the minimum required rate.

In addition, groundwater and surface water quantity and quality are monitored on a quarterly basis to determine seasonal flow conditions for the permit and adjacent areas. Further, handling plans have been implemented for earth, refuse, and acid-toxic forming materials, which will prevent or control discharge of pollutants to the hydrologic system. Implementation of these plans will be accomplished using the best technology currently available.

Based on the above, there is some potential for the operation to have an impact on the groundwater and surface water resources of the area; however, the impacts are expected to be minimal due to natural geologic and hydrologic conditions, and the implementation of control and protection systems. Therefore, the "Probable Hydrologic Consequences" of this operation are expected to be minimal, if not negligible.

7.28.335

Additional information will be provided if deemed necessary by the Division.

R645-301-728.340 N/A

This is an underground operation.

R645-301-728-400 Updated PHC

This document is provided as an up-dated PHC for the permit renewal in accordance with the State of Utah R645-Coal Mining Rules.

TABLE 1
POTENTIAL HYDROLOGIC IMPACTS

POTENTIAL IMPACT	POTENTIAL EFFECT	POTENTIAL MAGNITUDE OF IMPACT	PROBABILITY OF OCCURRENCE	MITIGATION MEASURES
Leaching of acid or toxic forming materials	Degradation of surface and groundwater quality	Low (no such materials present)	Low	Monitoring materials handled by approved methods
Groundwater Availability	Decrease in spring flow due to subsidence	Low to moderate depending on location	Low (No history of impact)	Monitoring
Groundwater Availability	Interception of groundwater by mine workings	Low	Low (on-going)	Monitoring
Groundwater Availability	Removal of water with coal	Low	Moderate (on-going)	Monitoring
Groundwater Quality	Decrease in quality due to hydrocarbons	Low	Low	SPCC Plan, monitoring inspections and maintenance
Sediment Yield	Increase in TSS	Moderate	Low	Sediment pond, diversions, sediment control, monitoring
Flooding	Damage to downstream area	Low	Low	Sediment ponds, diversions, and monitoring
Streamflow Alteration	Damage to streams due to subsidence	Low	Low	Protection of perennial streams, monitoring
Surface Water Quality	Decrease in quality due to hydrocarbons	Low	Low	SPCC plan, inspections, monitoring, maintenance
Surface Water Quality	Increase in TSS due to coal fines and dust	Low	Low	Sweeping of access road and pads, misting of coal
Surface Water Quality	Increase in iron concentrations in Crandall Canyon Creek as a result of mine water discharge	Moderate	Low (mine discharge is being treated)	Monitoring, Mine discharge is being treated
Surface Water Quantity	Decrease in flow in Crandall Creek below mine	Moderate	Low	Monitoring, maintaining baseflow
Surface Water Quantity	Increase in flow rates in Crandall Creek below the mine discharge	Low potential for negative impact; additional water of acceptable quality would likely benefit the overall aquatic habitat	Moderage	Monitoring, mine discharge is being treated